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The IRON AGE

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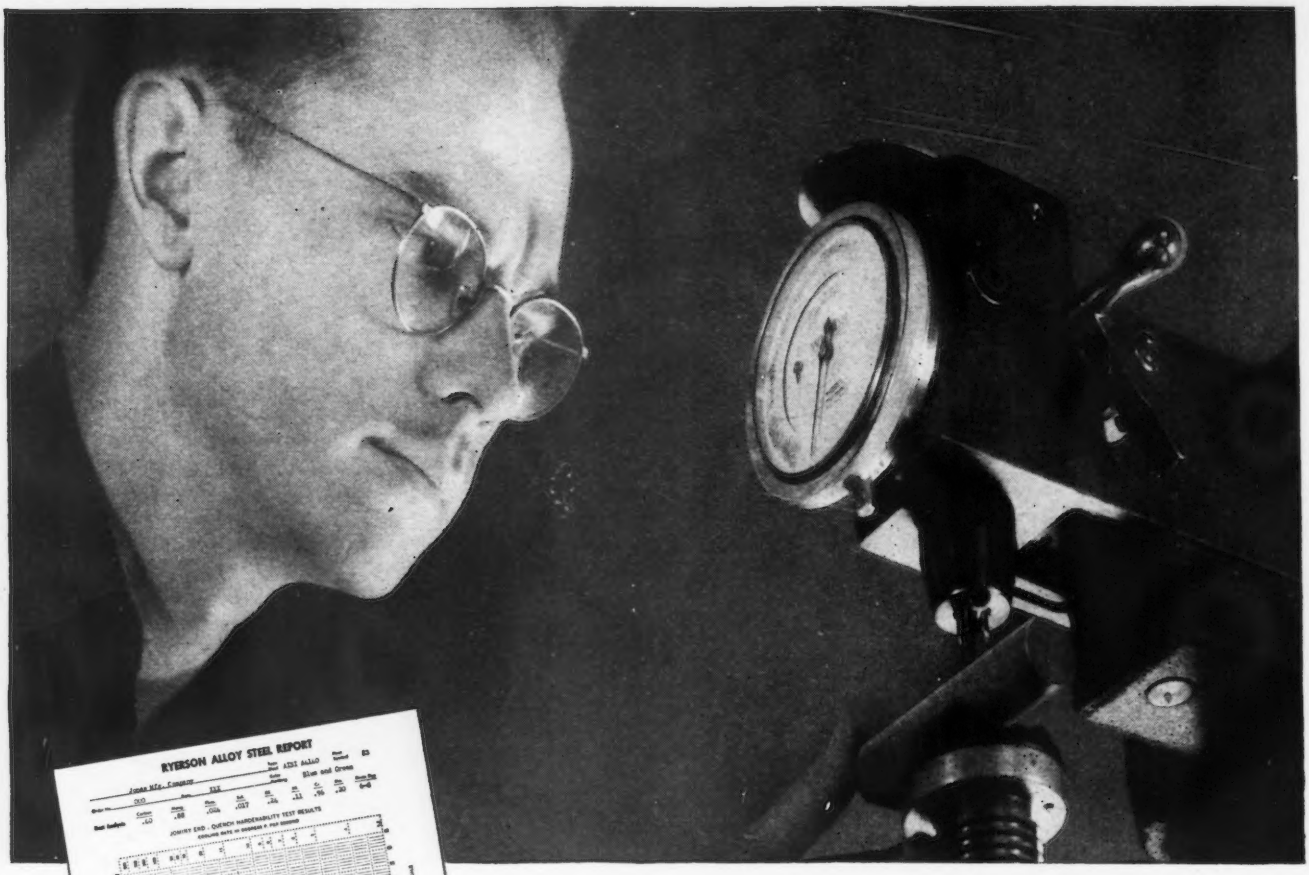

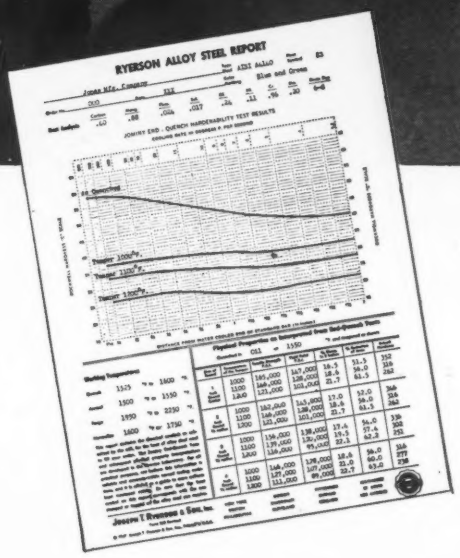
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.....The Proof of Performance is in the Testing

How Ryerson Tests Alloy Steel from Stock to Guarantee Quality and Guide Heat Treating

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Hugo to Churchill to Congress

LIKE an ever-contrary dream, the bright promise of a European Commonwealth has threaded through political thinking for centuries. In January, John Foster Dulles gave his blessing to European federation; a year ago Churchill rolled out his challenging prose at Fulton, Mo.; thirty years ago the American poet Lindsay cried for Europe to sew its flags together; a century ago Victor Hugo prophesied:

"I represent a party which does not yet exist
This party will make the twentieth century.
There will issue from it first
The United States of Europe, then
The United States of the World."

The case for European integration—whether political or economic, or both—has always been overwhelming in terms of pure logic. But any cooperative proposal has bristled with insurmountable difficulties—all the fears, jealousies, ignorance, disorder and caprice of national groups. Even the attempts to impose union by military force have been bloody failures.

But, today, a series of peculiar circumstances favors the creation of economic fusion. All over the United States there is a growing moral awareness of the international facts of life, prompted, to be sure, by distaste and fear of Communism. In England, there is full realization that economic health is tied irrevocably to the pattern of Continental recovery. In Europe, the devastation is so great that disaster looms forbiddingly as nation after nation eats up its remnants of wealth and credit. The need for sensible economic policies and more outside help is so pressing that any realistic and constructive proposal would be welcomed.

England controls the German Ruhr. America controls the dollars (i.e., the machinery and real goods) needed for European recovery. These are the two trump cards that probably will be played as a single hand before year's end. There is likelihood that a special session of Congress may convene this autumn to consider the State Department's assessment of foreign needs, to debate the creation of a peacetime Lend-Lease program, to pass on a long-range European recovery program involving many billions of dollars—all tied to a plan for economic integration west of the Iron Curtain.

Thus the American Congress will be the arbiter of Europe's future. Some Congressional sympathy for such a dramatic policy rests purely on the negative basis of trying to stem the flow of Communism. On the other hand, there is a growing realization that such an integrated program would in the long run be more effective and cheaper than the current patchwork of partially misdirected loans. It could create a Europe having possibilities of life and growth and it could provide the greatest single guarantee against depression at home and chaos abroad.

Support for the scheme ranges through both political parties. Mr. Hoover has spoken for it, Senator Lodge of the Foreign Relations Committee urges it, Mr. Stassen, Mr. Vandenberg, Mr. Dewey and Mr. Acheson have all spoken favorably.

Other events also point the way. The General Assembly of the UN plans to set up a European Commission, probably to act as a planning board for Europe, to handle loans and possibly to take over the administration of existing technical bodies, such as the European Coal Organization, European Emergency Committee and European Committee for Central Inland Transport. In Europe, the English and French are working on plans to transform their alliance into closer economic cooperation. And The Netherlands, Belgium and Luxemburg on Nov. 1 will initiate the Benelux Union for a common customs tariff, with further plans for common currency, transport, postal and industrial developments.

One major stumbling block may be the distaste in Congress for the dominating role of organized labor in European politics, and for the solid core of nationalization, socialization or government ownership already dominating the European scene. Even so, the world may yet see many Continental nations blended in economic fraternity without loss of distinctive qualities and glorious individuality. Even yet, hope, food and work may rout the forces of despair and fear.

T. W. Lippert

FIVE Advantages of Inland HI-STEEL

The low alloy, high strength steel

1 HIGHER STRENGTH

In contrast with ordinary structural steel, Inland Hi-Steel has nearly twice the yield strength, the same elongation, and almost 50% higher fatigue strength. With Hi-Steel, designers can increase strength without resorting to excessive weight and size of parts. On mobile units, Hi-Steel increases payload without sacrificing strength.

2 GREATER CORROSION RESISTANCE

Hi-Steel has more than twice the atmospheric corrosion resistance of copper-bearing steel and about five times that of ordinary structural steel. When its bare surface is exposed for a long period, the elements in it contribute to the production of a dense adherent rust which acts as a protective coating and greatly retards further corrosion.

3 MORE RESISTANT TO ABRASION

In resistance to abrasion, Hi-Steel is far superior to copper-bearing and ordinary structural steels. Coal companies and other bulk material producers use Hi-Steel in chutes, screens, and bunkers because of its long life. Where both abrasion and atmospheric corrosion are combined, Hi-Steel will outlast many "abrasion-resistant" steels.

4 EASY TO WORK

Because of its high ductility, Hi-Steel can be worked either hot or cold with little or no deviation from standard shop practice. It does not normally require heat treatment to retain or to restore its normal properties after working. Hi-Steel can also be flame cut as easily as ordinary structural steel, and can be welded by conventional methods.

5 LOW IN COST

The price per pound of Inland Hi-Steel is only moderately higher than ordinary structural steel. However, where a given strength is desired, sections of Hi-Steel can be made lighter, so the total cost of steel is frequently not increased. On mobile equipment, this weight saving quickly pays for the small difference in price by an increase in payload.

HI-STEEL meets the requirements of SAE Specification 950

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► Since one blast furnace could efficiently use at least 200 tons of 90 to 95 pct purity oxygen a day to enrich the blast, a mere dozen of these furnaces would burn more oxygen than the whole country used in its previous peak year. And it would take but six such installations to equal the estimated 11 billion cu ft (high purity oxygen) which is this year's estimated consumption. Of course, openhearth combustion and carbon reduction are the more likely uses in the immediate future.

► Half a million dollars has gone into development of a vacuum steel casting process that provides complete mechanical ocntrol of the casting operation on a production line basis. The new process, which draws the molten metal from the bottom up, is said to give about 20 pct higher yield, reduce foundry losses and improve operating conditions.

► Gas supply will not be any better in Pittsburgh next winter, unless the weather is moderate. Gas company representatives are so advising their customers and some have already started the switch to artificial gas storage facilities. Those planning to convert to oil standby equipment are finding the prospects gloomy owing to shortages in refinery and storage facilities which will undoubtedly continue through the critical months of the coming winter.

► Several large paint companies are working on silicone base paints for high temperature service. Possibilities are tremendous but developments are not perfected and no details are available for publication now.

► The French have earmarked $5 million of the recently granted International Bank loan for purchase of U. S. iron and steel products. French industrialists hope to get as much as possible in semifinished steel this year.

► Crowds at the machine tool show are expected to be so heavy that several machine tool builders will bring their own cars and station wagons to Chicago to supplement the special bus service show officials have arranged for.

► Part of the present freight car shortage harks back to war days when Washington refused to get excited about the matter: freight cars were not considered in the same class as ammunition. Since they were not given top priorities it is fortunate the war ended quickly for they wore out quicker than Washington realized. All the drum beating today won't replace the cars which have gone to the scrap heap.

► Some engineers see the possibility of far-reaching changes in the automobile industry as the result of "Boss" Kettering's new high compression engine. The new engine, which saves one third or more in fuel consumption lends itself best to overhead valves--which GM's Buick and Chevrolet now use. Among the independents only Nash uses overhead valves.

► British steel merchants--facing reduced business volume and smaller profits due to government control of the industry--are doing a big business in steel which is neither produced nor consumed in the United Kingdom.

► Belgian free market export steel prices--believed to have set a world record for prices asked by a steel company--have fallen off from that peak. The highest level for merchant bars, $152 a ton reached in February, has now reportedly fallen to about $140.

When the sellers market wanes it is believed that general modernization of sales conditions--rather than widespread price cuts--will mark the first effort to hold customers.

► In the contest to determine whether fluid couplings, automatic transmissions or torque converters will be used for automobile transmissions, the torque converter is reported to be outdistancing the pack. Important announcements on such developments are expected soon but the changeover will likely occur in stages and hardly before 1948.

► Some manufacturer's inventories--notably those of the freight car builders--are in an acute state of imbalance. Industrialists making consumer goods are worrying about cancellations and are looking carefully at their competitive position. Today's performance, they say, is the key to the future.

► The Senate gray market steel hearings will probably not uncover any new method of drying up what is left of the daisy chain but they will produce suits and counter-suits among witnesses, alleging everything from bad faith to libel.

A New Principle in I

Constant work coil power output, stepless power control, gaseous electronic tube energy conversion and inexpensive, easily assembled work coil construction are features of the Gordon Trigatron, a new type of induction heating apparatus described herein.

FIG. 1—Work coil construction for the Gordon Trigatron is relatively simple. Ordinarily 1/4 or 3/16-in. copper tubing can be formed into any reasonable shape and used as the work coil.

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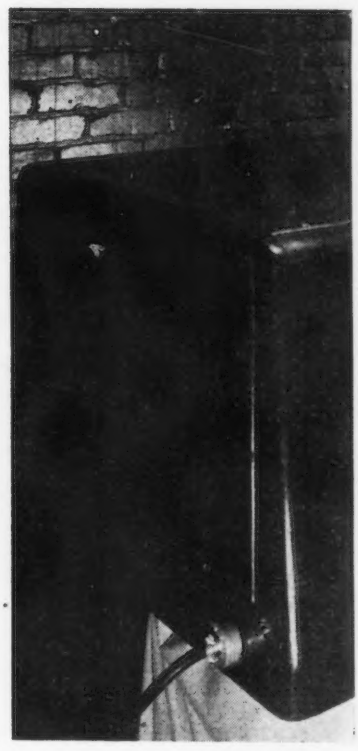

FIG. 2—The use of universal work head connectors for high frequency and water output to the work coil eliminates flaring, fitting and special hardware.

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THE Gordon Trigatron, embodying a new principle in high frequency induction heating, has been designed primarily as a production line machine tool that will yield consistently good results in the hands of nonskilled workers. It is designed around a new circuit principle and a radically different type of gaseous electronic tube. Among the features claimed for it by its manufacturer, Gordon Electronics, Inc., Pittsburgh, are constant work coil power output, stepless power output control, high operating efficiency with operating frequencies in the range of 500,000 cycles that can be adjusted upward or downward, unit part construction, and a quick, inexpensive work coil construction that permits a wide range of easily produced work coils for a variety of heating tasks.

The unit is functional in design with a minimum of mechanism that makes for less maintenance and greater amounts of trouble free operation. It has high safety and overload factors that permit its use under a variety of conditions, and it uses standard three-phase power input and normal water lines and connections for cooling.

In the Trigatron circuit, the instrument used in converting 60 cycle energy into radio frequency energy is a specially designed gaseous three element tube. A fundamental characteristic of this type of electronic tube is its constant output and conversion factor throughout the life of the tube. Diminishing electronic emission of the cathode has no effect on output. The tube neither increases nor decreases in performance until the gas content of the tube becomes inadequate or the electronic emission source fails completely, stopping the functioning of the tube. Life curves of this type of tube show a constant output until tube failure. Complete failure of the tube does not damage other parts of the machine since the failure in effect

Induction Heating

By THOMAS E. LLOYD
Pittsburgh Regional Editor,
THE IRON AGE

opens the circuit of the machine making it inoperative. In practical applications varying input line voltages will vary the output of radio frequency energy. This is overcome, if necessary, by the use of a constant voltage transformer.

It has been determined by various authorities in the induction heating field that the most practical induction heating unit should operate at frequencies in the range of 400,000 to 600,000 cycles. These frequencies are most suitable for the majority of the work in heat treating, annealing, brazing and hardening. The Gordon unit is designed for about 500,000 cycles. However, upward or downward adjustments of this operating frequency are easily made. Under actual operating conditions, when a small coil is used with very low inductance, the operating frequency is high because the variable inductance in the generator is adjusted to match the resonant frequency of the tank condenser and work coil. The type of work that requires a small inductance coil usually requires a high operating frequency, and when a large coil is used and properly matched to the generating circuit the fundamental frequency is thereby slightly lowered. If desired, the Gordon Trigatron can be adjusted for frequencies as low as 50,000 to 100,000 cycles by changing the generator circuit.

As pointed out, the bulk of the applications of induction heating require frequencies around 500,000 cycles. The two main exceptions, however, are melting, requiring a lower frequency, and some special heat-treating applications on very small objects, requiring higher frequencies. Gordon type machines have been operated at frequencies as high as 2 million cycles, according to the company.

Efficiency of the unit has been accurately measured by reading the power input in kilowatts and by using a calorimeter together with thermometers and a very accurately calibrated flow meter. Thus, actual Btu's generated in a *workpiece* have been measured. To date, the highest measured efficiency by this method of calibration is 66 pct, which, interpolated into the efficiency formula generally used yields an efficiency factor of better than 75 pct. The main reason for this high efficiency is the new circuit used in the machine and the radically different type of gaseous electronic tube.

One of the basic features of the Gordon Trigatron is the ease with which work coils can be constructed. Through the use of standard output connectors in the work head of the machine for both the high frequency output and the water output to the work coil, no flarings, fittings or special hardware are required. Ordinary ¼ or 3/16 in. diameter copper tubing can be wound, as shown in fig. 1, into any reasonable shape, diameter or length, regardless of the number of turns,

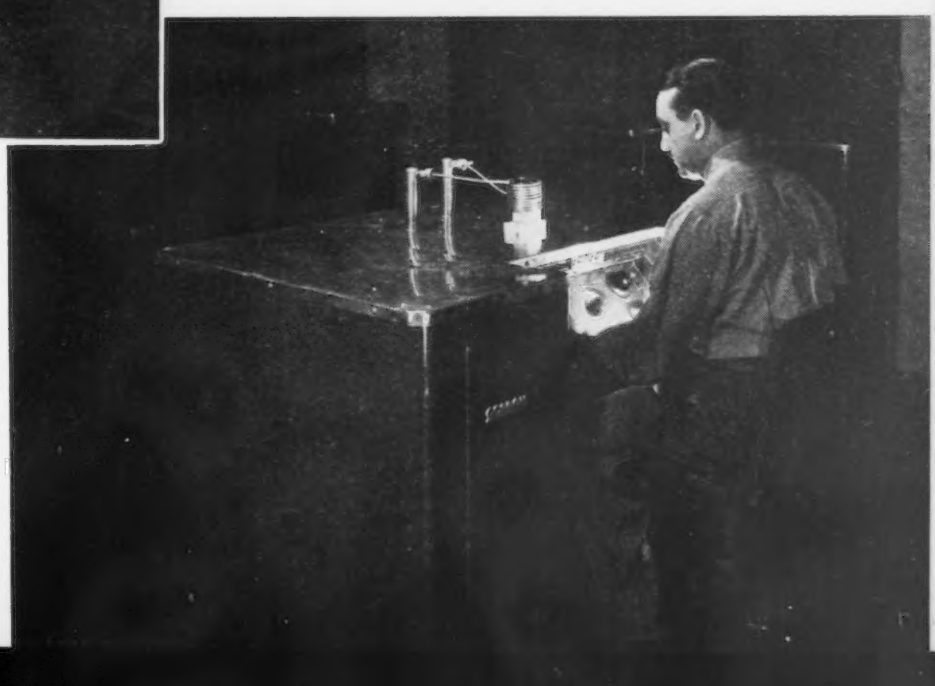

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FIG. 3—Functional in design, the Trigatron can be used as a work table or be placed in a production line and used as a production tool. All controls are immediately before the operator, and machine settings can be locked so that the operator cannot tamper with the work cycle.

and the tube ends are then inserted into the universal work head connectors, illustrated in fig. 2. The wide range of inductance is matched in the machine by a simple balancing adjustment that requires neither special knowledge nor skill.

Another advantage claimed for the Gordon unit is stepless power control ranging from practically zero power output at the work coil to 100 pct power output. In addition, it is possible to take a given mass of metal to any specific temperature and hold it to that temperature constantly and accurately. One field in which this type of operation is important is in the heat treating of alloy steels and tool steels. Many heat-treating schedules call for the work to be raised to temperatures in the neighborhood of 2150°F and held there for specific periods of time to accomplish certain metallurgical phase changes.

In practice, by feeding full power to the mass of metal for a given length of time, the initial temperature is achieved. Then the machine is cut back to a predetermined lower power output, at which the metal will hold the temperature. This is accomplished by keeping the power input into the work coil equal to the radiated energy of the piece. By connecting an automatic timer to the machine, a work cycle can be set up that yields consistent and uniform results. All parts of the Trigatron have been designed with a high safety factor. The transformer has a safety factor of 100 pct even when operated under a continuous load 24 hr a day.

Mechanical adjustments, delicate instruments and complicated circuits have been eliminated. The only parts of the machine that have a definite life cycle are the gaseous electronic tubes which, during their operating life, require no adjustments or checking of meters. These are guaranteed for 1000 operating hr, but use has shown they are effective for 5000 to 10,000 hr.

The unit is functional in design with respect to use, as shown in fig. 3. It is of steel construction with a stainless steel top and the machine is 36 in. high. Where the high frequency energy is needed to work in conjunction with other equipment, the machine can be backed up against the associated equipment and a production line technique used.

Water Requirements Low

Water lines of the machine require no insulating rubber hose between the machine and factory water outlets. Metallic water lines can be connected directly to the machine with standard plumbing fixtures. Water requirements of the machine have been kept to a minimum of 1 gpm at 25 psi, especially useful in factories where pressure and water flow are low.

To combat any ill effects of hard water corrosion and deposit, fairly large water lines of copper are used. High frequency energy travels on the outside of a conductor and the increased electrical resistance of interior wall deposits have very little effect on the radio frequency resistance of the circuit. The water cools only the work coil and is not used to cool tubes of instruments. Power input is three-phase with as close to unity power factor as possible to prevent unbalance of the factory's power lines. The machine has in it inherently a leading power factor, which is an advantage because it helps to correct the normal power factor of the plant.

The Gordon Trigatron is built in a wide range of power output. The 1-kw output machine will handle all small silver brazing jobs such as small objects like watch parts, small motor parts, and small machine parts. The machine will also soft solder objects on the order of 6 or 7-in. in diam, such as condenser frames, etc. The 1-kw unit will harden small objects on the order of typewriter parts, and can melt efficiently a few ounces of metal.

The 10-kw Trigatron will handle most soft soldering encountered except very large objects. It will handle silver brazing, and will heat treat objects up to 5 lb. This unit will melt in the order of 10 to 15 lb. The 30-kw unit can handle practically all soft soldering, brazing and hardening problems encountered in most manufacturing, and will do so at high speed. It will melt between 50 and 100 lb of metal at efficient speeds.

The 50, 100, and 200-kw output will be used fundamentally to obtain very accurate and shallow hardening at high production rates, or to soft solder and braze objects at high speeds. These can be used to heat treat fairly large objects such as large gears, and a further function will be to melt greater amounts of metal. However, because output power can be controlled in a stepless range from practically zero to 100 pct output, large machines can be run at reduced power with the power used being proportionate to the work performed.

Self-Contained Working Units

The Trigatron is made up of six self-contained working units. These are: (1) The low frequency power supply; (2) the automatic regulator circuit; (3) the radio frequency generator circuit; (4) the output circuit; (5) the control panel and the safety devices; and (6) the variable power output circuit. These circuits are complete in themselves, electrically and mechanically, and are mounted each on a common housing. If for any reason a part of the machine should fail, the entire unit in which the part failure is located can be removed and a new unit installed. The only parts that have a measurable or definite life are the tubes and they are arranged so that they can be replaced easily.

The safety devices installed in the machine are extensive. In addition to the usual interlocking electrical safety switches built in all removable panels, grounded work coils, and grounded steel cabinets, there are several unusual safety factors. Condensers in the machine cannot be left in a charged condition when the machine is turned off. The condensers are automatically discharged when the machine is turned off. This permits working on the condensers without fear of shock when the power is off.

Instead of using water pressure switches to check whether or not the water is on when the machine is operating, a three-fold safety measure is adopted. An electrically-operated solenoid water valve turns the water on when the machine is running.

In the wasteline running from the machine, there is a simple flow meter. When the water is not flowing through the circuit in adequate volume, this latter device will shut off the machine. Last, all copper lines carrying high frequency energy are water cooled and made larger and heavier than the work coil. Therefore, if the safety devices fail, the weak link is the work coil which will melt and burn out, long before there is any failure of interior parts.

Currently, the Trigatron is available in five models: 1, 5, 10, and 30 kw output. All machines are furnished three-phase, 220 or 440 v, at 60 cycles, but other voltages and frequencies can be built on order. The 1-kw unit is also built in single phase, 115 v, 60 cycle ac operation.

Spotweld Analyzer For Maintenance Work

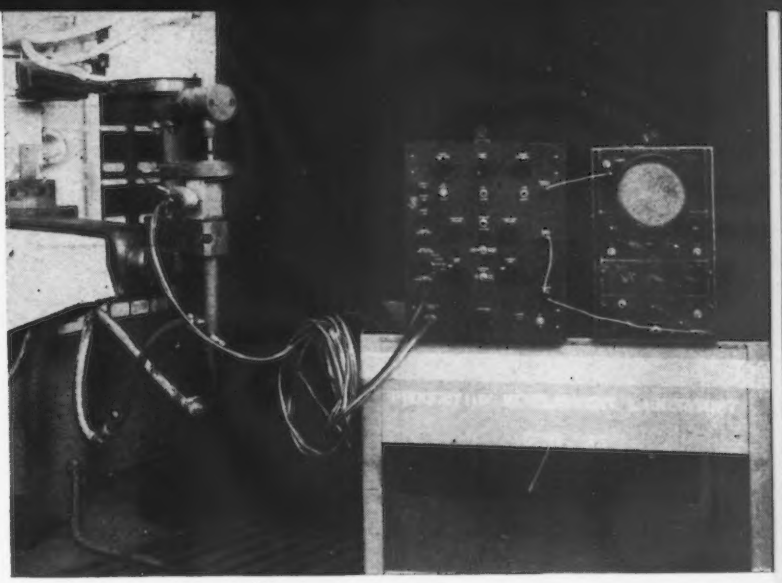


FIG. 1—Simple to operate, easy to set up, and possessing laboratory accuracy, this analyzing unit will indicate the condition of any type of spotwelder.

By D. F. HAYS
North American Aviation, Inc., Inglewood, Calif.

Designed as a practical working tool for use by spotwelding machine maintenance crews, a complete performance analyzer having all the characteristics and accuracy of laboratory equipment is described herein. Readily portable, quickly set up, and easily operated, it provides the maintenance man with a means of obtaining urgently needed information in order to keep welding machines in operating condition.

SINCE the time spotwelding started its recent advance as a precise process capable of joining critical parts for aircraft, there has been an increasing need for means of studying the welding current and dynamic tip force at the point of the weld.

The intensive development of such equipment was begun as soon as the need was felt, with many aircraft companies and government-sponsored laboratories independently producing analyzing equipment. Most systems consisted of standard laboratory apparatus assembled on a cart and connected to a photographic recording oscillograph. The great majority of such arrangements utilized electric resistance strain gages mounted on the electrode of the machine for the force pickup and a shunt consisting of a section of electrode or a relatively high resistance insert in the electrode as a current take-off. Force and current signals were amplified and applied to two oscillograph galvanometers.

The advantages of this system for research lay in the permanent record obtained of every test, and the several extra oscillograph channels available for recording tip, sheet, and coolant temperatures, line voltage, time, electrode travel, etc. The two disadvantages that prevented the widespread use of such equipment by production personnel were the wait for film development—a matter of from 15 min to several hours—and the difficult and complex job of setting up on the machine and making preliminary adjustments.

Largely as a result of information obtained from such equipment, it became possible to set up quality control systems involving periodic checks of machine performance against established standards.

It is apparent that the welding machine maintenance crew, in order to support such a system, has constant need of equipment which will quickly and conveniently provide him with the same information as is obtained by the complicated and cumbersome equipment used in welding research work.

The requirements for satisfactory equipment to meet the needs of maintenance workers were not difficult to determine. The system must be light, portable, and rugged. It must have a minimum number of controls, and these must be simple in operation and clearly marked. Setup time on a machine must be short and the equipment must be usable on any type machine, whether straight transformer, electrostatic, electromagnetic, or electrochemical storage type. Indications must be instantaneous and continuous, but with provision for recording if desired. The indications must give a true picture of tip force and welding current variations with time, and provide a ready method of timing parts of the welding program. The entire apparatus must be small enough to be conveniently stored in an ordinary cabinet.

Since the force-time characteristic at the tips may only vaguely resemble the performance predicted from knowledge of the air or hydraulic actuating pressures, due to friction, inertia, and throttling effects, it is important that any system of measurement used should indicate conditions at the welding tips themselves.

The equipment shown in fig. 1 and in the block

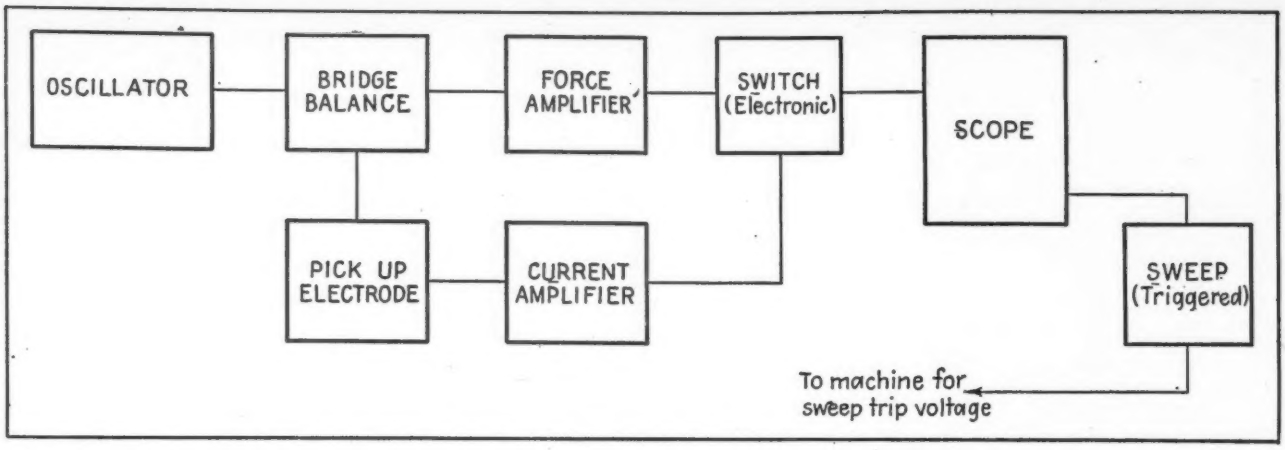


FIG. 2—Schematic diagram of the arrangement of the various units comprising the analyzer.

diagram, fig. 2, was built to comply with these requirements. Electric resistance strain gages purchased from Baldwin Locomotive Works are used as the force indicating elements; four 120 ohm gages are bonded to the electrode a few inches back from the tip. To minimize inductive pick-up from the field of the welding current, the four gages are placed symmetrically on the electrode, two vertically as compression legs and two circumferentially as tension legs of a bridge; all leads are placed as nearly as possible in symmetry. One electrode of each size used is equipped with gages. One corner of the bridge is grounded to the electrode and this point is used as a ground reference for the entire system. The bridge is fed from a resistance-stabilized phase shift oscillator through a power amplifier. Automatic volume control on the oscillator supplied by the output of the amplifier keeps oscillations at a low level and insures the required, nearly perfect, sine wave output. Inverse feedback from the bridge itself to the oscillator amplifier minimizes any change in wave form due to the amplifier tube or output transformer. An oscillator frequency of 1000 cycles per second was selected as a compromise between ease of amplification and filtering, and the effects of lead capacitance and inductance.

Resistance bridge balance is obtained by shunting the two opposite ungrounded bridge corners with a helical potentiometer and grounding the arm. Buffer resistors are in series with the ends of the winding to narrow the balancing range and increase the ease of balance. With the helical potentiometer only one control is needed for resistance balance. Reactance balance with one control is obtained by a potentiometer with condensers in series with the legs connected across the resistance balance potentiometer. Since input matching transformers have been found to introduce hum and welding current transients to a greater extent than they boost the signal, the bridge output is fed straight to the grid of the force amplifier. The force amplifier contains two high gain stages and a low gain stage and is built around a band-elimination filter tuned to oscillator frequency and connected to provide strong inverse feedback across the amplifier of all frequencies other than oscillator frequency. This discrimination in the amplifier serves to eliminate any extraneous signal from the welding current of the machine under test or from adjacent machines, but is broad enough to pass the most rapid changes in force encountered on welding machines, so that tip hammer and bounce are not masked.

The output of the force amplifier is full-wave rectified by a push-pull transformer and two crystal diodes, filtered to remove the 2000 cycle ripple and applied to one input of the electronic switch. The other input of the switch is supplied with a signal representing the welding current, obtained by amplifying the output from either a 2-in. section of electrode used as a shunt or a special toroidal pickup coil placed around the electrode. The integrating network for the toroid is built into the coil case, and by a system of adapters either the shunt or the toroid may be used.

The electronic switch is necessary to observe two phenomena simultaneously on a single-beam oscilloscope tube. It consists of a dual triode multivibrator, a dual triode as amplifiers, and two pentodes as high-gain switched amplifiers. The action of the switch is to block the amplifiers alternately, the common output consisting of small pieces of each input signal in succession. When this output is applied to the vertical deflection plates of a cathode ray oscilloscope two traces are seen, for tip force and welding current, each trace consisting of a series of dots so close together as to appear as a continuous line on the special oscilloscope tube.

The switch provides two chopping rates—1000 per sec and 100 per sec. When operated at normal sweep speed, the 1000 per sec dots are not resolvable by the eye, but the 100 per sec dots show as discreet dashes in the traces and provide a convenient and accurate means of measuring time intervals in the welding cycle.

The oscilloscope is a standard Du Mont 208-B modified to allow signal injection into the direct current amplifier portion of both the vertical and horizontal deflection amplifier systems. The oscilloscope cathode ray tube has been changed to a 5LP7. The P7 phosphor produces a brilliant blue fluorescent spot while excited by the electron beam, followed by an amber phosphorescent afterglow which can be observed for a minute or more with the aid of a viewing hood.

To observe the welding current and tip force as a function of time, it is necessary to move the two spots across the screen at a constant speed while the weld is being made. This is accomplished by incorporating in the instrument a linear triggered sweep

circuit. A pentode tube, clipped to limit its operation to the constant-plate-current portion of its characteristic, is used as a constant-current device to charge a condenser. Sweep time is variable in two ranges from 1/10 sec to 5 sec by adjustment of the cathode bias resistor. The sweep is triggered by one of a set of relays of various coil voltages which can be chosen by a selector switch to match the sweep triggering voltage tapped into on the welding machine. Usually the sweep trip leads, fitted with alligator clips, are clamped across the coil of the relay actuating the solenoids that lower the head of the machine. An adjustable time delay is provided to delay the start of the sweep after the initiating pulse is received, so that the picture on the oscilloscope can always be made exactly to fill the screen, or any portion of the welding cycle can be selected and expanded on the screen for study. A second time delay circuit is provided to lock in the sweep circuit for long enough to complete a weld cycle, because the relay in the welder selected for sweep trip usually drops out before the weld cycle at the tips is completed.

The outputs of the force and current amplifiers in addition to driving the oscilloscope through the electronic switch also feed through cathode follower stages to terminals on the panel so that if desired a recording oscillograph can be used simultaneously with the visual observation.

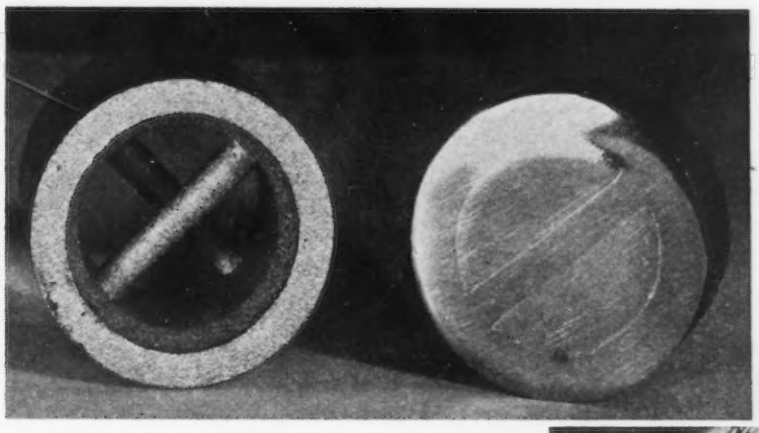
Approximately 5 min are required to install the electrode equipped with strain gages in the machine to be tested, balance the strain gage bridge, connect the sweep trip leads and make all adjustments preparatory to operation.

Bimetal Casting Used in Auto Camshaft

BIMETAL casting of a camshaft for the four cylinder British-built Ford motor has been practiced since production was resumed at the end of the war, with results that are encouraging other possible applications of this process by the company. The part involved called for the use of a standard gray iron casting, except that the design specified that the center bearing should take the form of a distributor gear. The heat-treated gray iron was not sufficiently hard to permit the use of this material and obtain good wearing properties for the gear, so the alternative system was devised.

The system in use at present utilizes a separate casting for the gear with 1.3 pct C, plus Si-Cr alloy material, which is cast with two crossbars through the center (see fig. 1). The bushing is then heat treated to a Brinell hardness of 187 to 241 for machinability.

This bushing having been cast to serve as the gear is then set in the mold in a ramup core and the gray iron is run in around it, being cast in the normal manner. As it is being poured, the gray iron goes through the center of the bushing and is firmly fixed in place by the two crossbars (see fig. 1). The cams are flamehardened after the teeth are cut into the gear, and the gear teeth are also flamehardened and quenched in oil. The finished shaft is shown in fig. 2.



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ABOVE

FIG. 1—Gear casting (left) which is cast into the camshaft for use as a distributor gear. Section at right shows the insert with the core of the camshaft base iron.

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o o o

BELOW

FIG. 2—Finished camshaft showing machined distributor gear insert.

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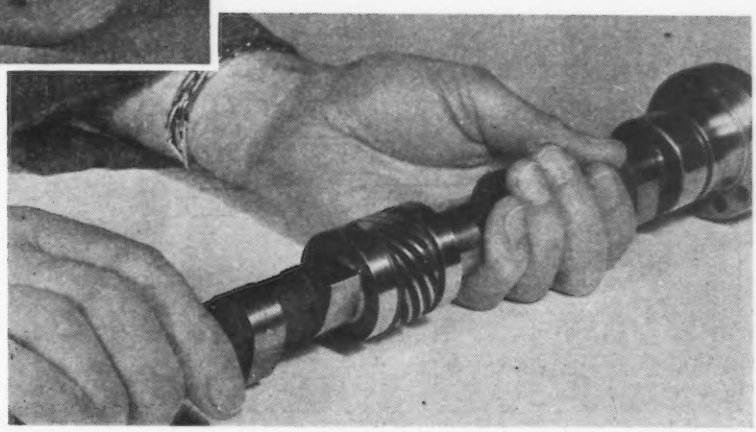
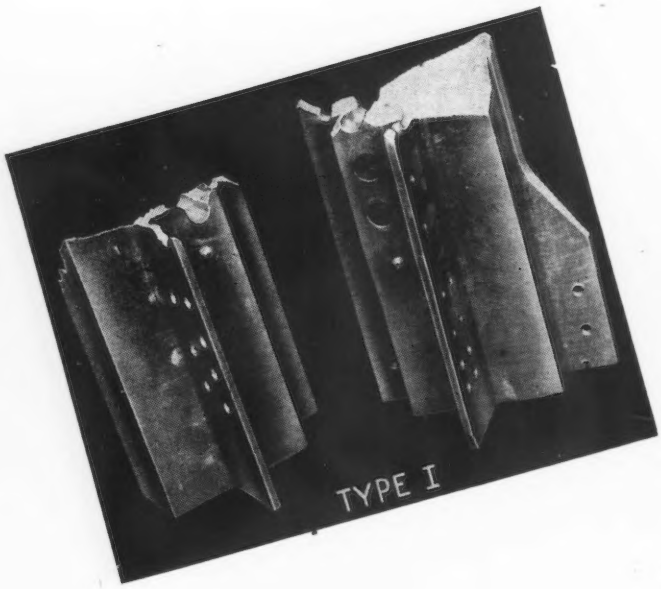
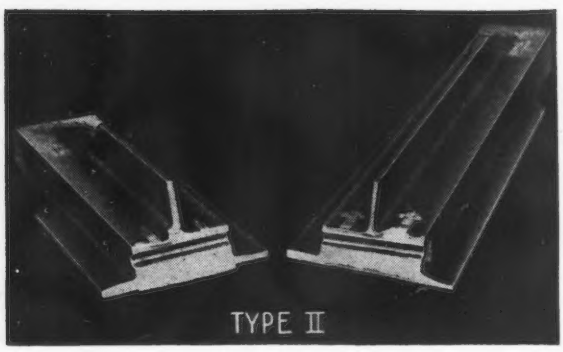
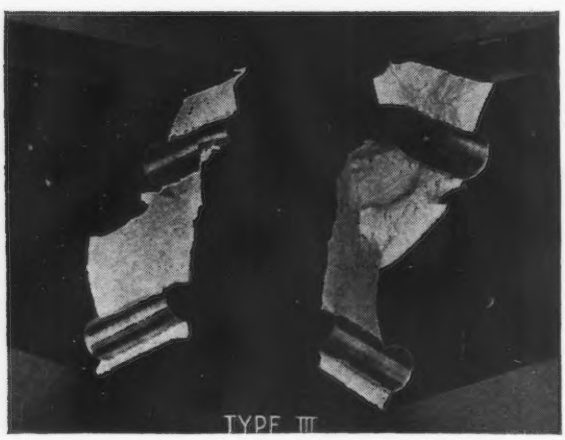


. . . Notch Effects in High





PHOTOGRAPHS showing three types of full section spar caps with unloaded bolt holes, which were tension loaded to failure.



AIRFRAME manufacturing problems, such as (1) the effect of a deep scratch when forming a sheet, or (2) the effect of a bolt hole on the strength of a spar cap, have prompted the Douglas Aircraft Co. to make some fundamental studies of the effect of internal and external section discontinuities on the notch sensitivity of aluminum alloys. The interesting results of these studies are summarized in this article.

For the study of notch effects on ultimate strength, full spar cap sections of 14S-T and 75S-T aluminum alloys were examined in tension together with test specimens taken from bars, plates, and extrusions of 14S-T, 24S-T and 75S-T alloys. For the study of notch effects on limiting strain, test specimens of the three alloys taken from extrusions and bars were examined in tension and in bending.

The presence of a notch changes the ultimate strength and the limiting strain characteristic of a material. The order of change in these two properties is usually quite different for any one material. The notch sensitivity of a material cannot be described as high or low, since a single material may possess a

This article, a condensed version of several papers written by L. Schapiro and H. E. North, C. H. Stevenson, D. L. Moseley, O. A. Wheelon and St. J. Barrett, Douglas Aircraft Co., Inc., was prepared by L. Schapiro.

low sensitivity as regards its change in ultimate stress, but a high sensitivity as regards its change in limiting strain when a notch is present. To permit better understanding of results of notch sensitivity studies, it is advisable to discuss *stress notch sensitivity* as separate and distinct from *strain notch sensitivity.*

Stress Notch-Sensitivity

In a test of static tension loading to failure, the maximum load sustained by the section—when divided numerically by the original area—is reported as the ultimate strength of the material and may be termed the "mean apparent ultimate strength." When the test section contains an internal or an external notch, the maximum load sustained by the section—when divided numerically by the reduced original area in the plane of the notch—is reported as the "notched ultimate strength (net area)." For various types of notches, notch root radii and notch depths (also expressed as fraction of original area removed by the notch) some materials may have higher notched ultimate strength (net area) than unnotched ultimate strength, or—in the engineer's terms—an efficiency

Strength Aluminum Alloys

Based on the premise that the presence of a notch changes the ultimate strength and the limiting strain characteristics of a material, the authors conducted an investigation to evaluate the relative notch sensitivity of aluminum alloys 14S-T, 24S-T and 75S-T. Results of this study are presented from the standpoints of both stress notch sensitivity and strain notch sensitivity. Effects of holes in large structural members are also discussed.

greater than 100 pct. In a notched specimen, maximum load never exceeds the maximum load of the same original section unnotched.

A notched member, stressed in the elastic range, develops stress concentrations at the base of the notch which are functions purely of notch geometry and not of the material involved—as expressed by the classical stress concentration factors. In the plastic range, however, these stress concentrations become redistributed across the notched plane. The amount of redistribution of stress is a function of the material and proceeds by local straining and strain hardening. A notch-sensitive material will undergo a small degree of stress redistribution and will rupture at the point of maximum stress concentration. The mean stress in the plane of rupture can be less than the mean apparent ultimate strength of the material. An ideal notch-insensitive material will undergo the maximum amount of stress redistribution and strain hardening and will rupture across the entire plane of the notch. The ideal notch-insensitive material may be defined as one which undergoes such a degree of stress redistribution and strain hardening that the fracture load in terms of the gross area will correspond to the mean apparent ultimate strength regardless of notch depth. This definition of an ideal material may be expressed mathematically by:

$$(1 - x)S_n = S_u, \quad 0 < x > 1 \qquad (1)$$

in which S_n = notched ultimate strength (net area), failure load ÷ original area below notch, S_u = ultimate strength (unnotched), and x = fraction of original area removed by notch.

Equation (1) may be put in the form:

$$\text{Log}\,\frac{(1 - x)S_n}{S_u} = 0 \qquad (2)$$

which has been done because the latter equation plots a straight line on semilog paper and lends itself to extrapolation from few test points. The ideal material will thus plot as a horizontal straight line on a semilog chart with the left-hand term of equation (2) as ordinate and x as abscissa. Equation (2) may therefore be written:

$$\text{Log}\,\frac{(1 - x)S_u}{S_n} = -Nx \qquad (3)$$

in which the value of N is zero. If N is termed the index of stress notch sensitivity, an ideal notch-insensitive material would have an index value of zero and the more notch-sensitive a material the larger its index value would be. The tests herein described were small in number but were selected to check the validity of equation (3), or to determine usable modifications.

One series of tests comprised materials, specimen dimensions and notch types, enumerated in table I. Notched ultimate strength results from this test series are plotted in fig. 1. Agreement of test results with the logarithmic expression of equation (3) is of a fairly good order. Index values N from these data are listed and compared in table II. These data indicate that aluminum alloy 75S-T is more stress notch-sensitive than 14S-T and alloy 24S-T is more stress notch-sensitive than 75S-T.

It is recognized that the stress notch-sensitivity

TABLE I

Description of Notch Types Studied, Notched Depths, and Materials

Notch Designation	Notch Type	Notch Dimension	Notch Depths Pct Removed Area	Specimen Cross-Section	Material		
					14 S-T	75 S-T	24 S-T
1	External, sym., sharp	60° V, 0.002-in. root radius	4-7.8-15.3	0.505 in. diam	Rolled	Extruded	Rolled
2	External, sym., dull	60° V, 0.02-in. root radius	4-7.8-15.3	0.505 in. diam	Rolled	Extruded	Rolled
3	External, pseudosym., sharp	60° V, 0.002-in. root radius	4-8	0.500 in. by 0.150 in.	Rolled	Extruded	Extruded
4	Internal, axial	Drilled hole	4-8	0.500 in. by 0.150 in.	Rolled	Extruded	Extruded
5	External asym., sharp	60° V, 0.002-in. root radius	4-8	0.500 in. by 0.150 in.	Rolled	Extruded	Extruded

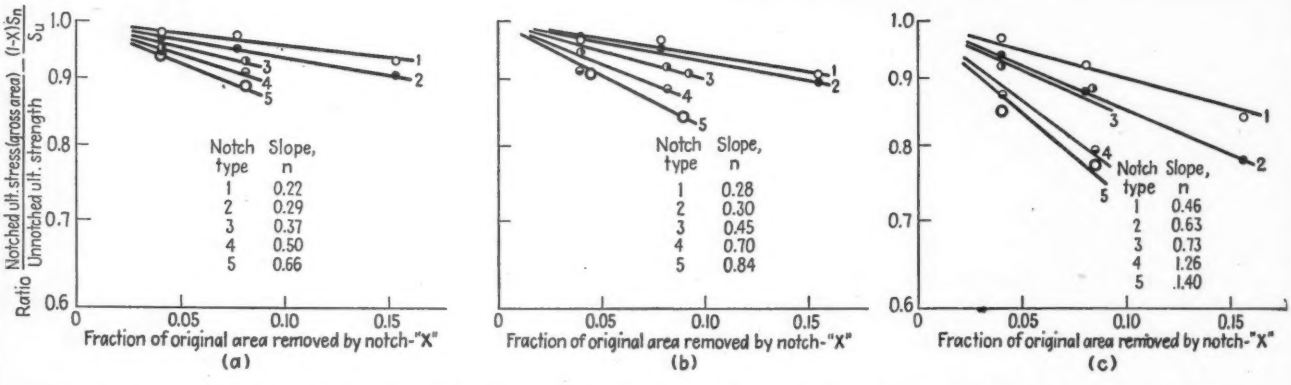


FIG. 1—Notched strength of (a) 14 S-T, (b) 75 S-T, and (c) 24 S-T, aluminum with five notch types and several notch depths. Slopes of logarithmic relationships increase in the order of the notch types.

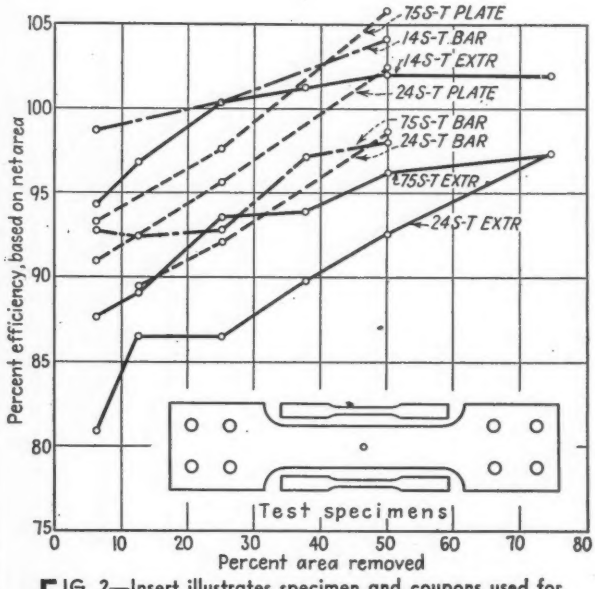


FIG. 2—Insert illustrates specimen and coupons used for test. Curves indicate effect of single hole in tension member.

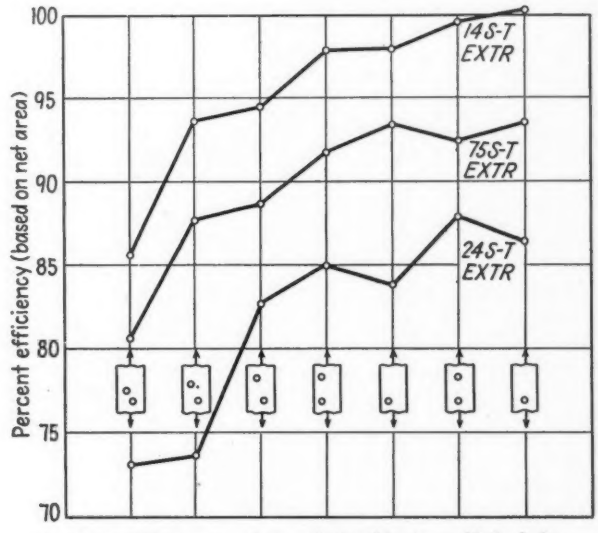


FIG. 3—Efficiency and its relationship to multiple holes as shown in figure.

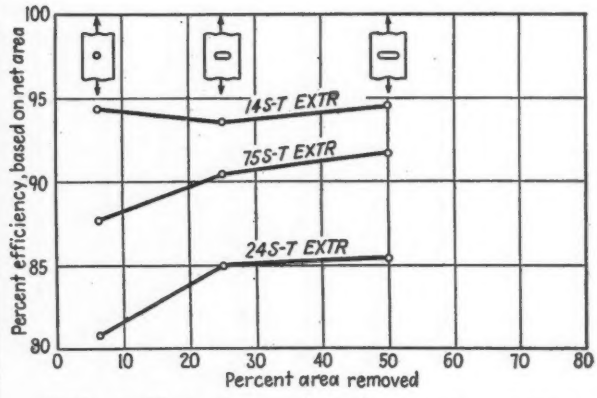


FIG. 4—Effect of internal notch in tension member. Shape of centrally-located slot is as shown in the figure.

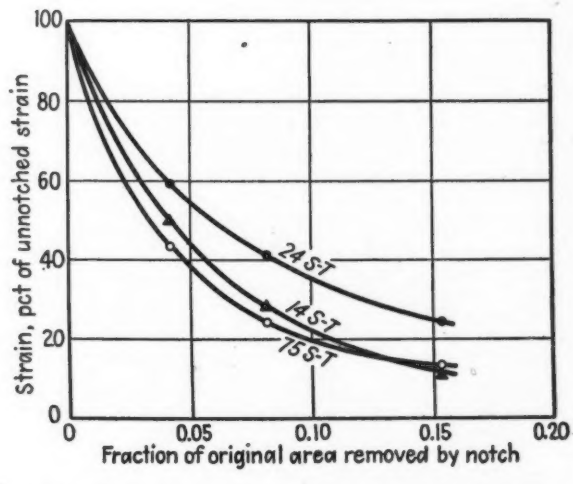


FIG. 5—Ductility of 14 S-T, 75 S-T and 24 S-T aluminum alloys as affected by notch type No. 1.

indexes presented herein are not to be taken as fully substantiated values. The logarithmic curves of fig. 1 are in most cases drawn through two points that are not adequate to establish the curves. Furthermore, the curves are drawn as though all pass through the origin, in accordance with equation (3). Later evidence collected in the author's laboratory indicates that at least for some types of notches the relationship may be better expressed:

$$\text{Log}\,\frac{(1-x)S_n}{S_u} = -a - Nx \qquad (4)$$

One pressing design problem is the effect of holes in large structural members. This problem naturally divides itself into three classifications: (1) that of a single hole, (2) that of multiple holes, and (3), that of a hole which is used to apply the load to the member. The most important part of the problem at the time this work was undertaken was that of tension loads. As a result, this work was confined to axially-loaded tension specimens only. The materials investigated were aluminum-alloy plate, sheet, bar, and extrusions in the commercially designated 14S, 24S and 75S alloys. A few specimens only were made in sheet, all of which were 0.102 in. in thickness. Most of the work was done on specimens ½ in. thick because large, heavily-loaded structural members are the most important and most likely to have large attachments in them.

Single holes were drilled in the center of the large tensile specimens (as shown in fig. 2), and the ultimate strength determined with an ordinary tensile testing machine. The size of the hole was varied to change the amount of area removed for different tests. Results are shown in fig. 2. The ordinate—percent efficiency—is based on net area after drilling the holes; the abscissa—percent area removed—is the ratio of the hole diameter to the width of the specimen. It will be noted that the curve for 75S-T bar is somewhat erratic and does not have the characteristic shape of the other curves in this figure. This bar was an experimental piece of material and was considered to be unsatisfactory by the fabricator. With the exception of this 75S-T bar, all the curves have the same general shape but are displaced vertically depending upon the alloy and the method of fabrication.

It is interesting to note that, when any one alloy is considered, the order from top to bottom in all cases is plate, bar, and extrusions. If any one method of fabrication is considered, the order from top to bottom is always 14S-T, 75S-T and 24S-T.

The same relative order of stress notch-sensitivity for the three alloys exists with multiple holes (fig. 3)

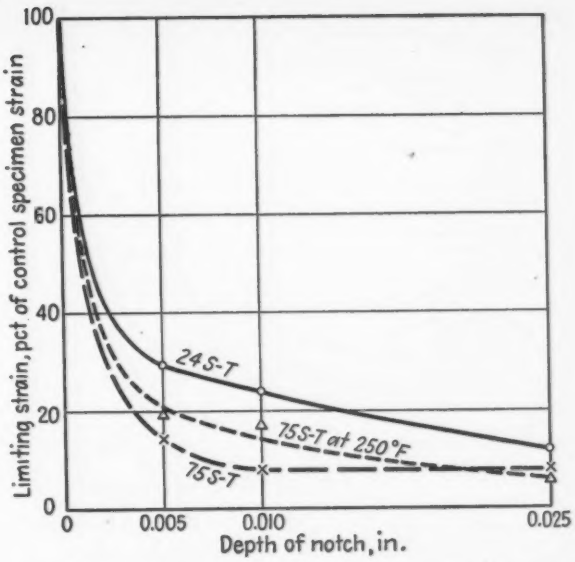


FIG. 6—Curve showing relationship between limiting strain and notch depth for specimens 24S-T and 75S-T.

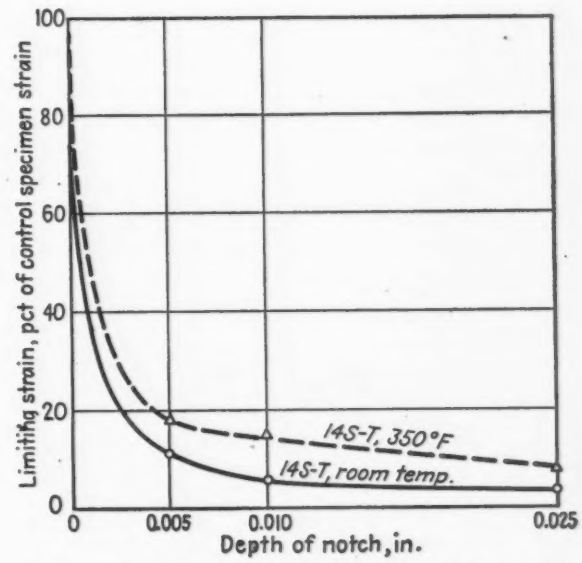
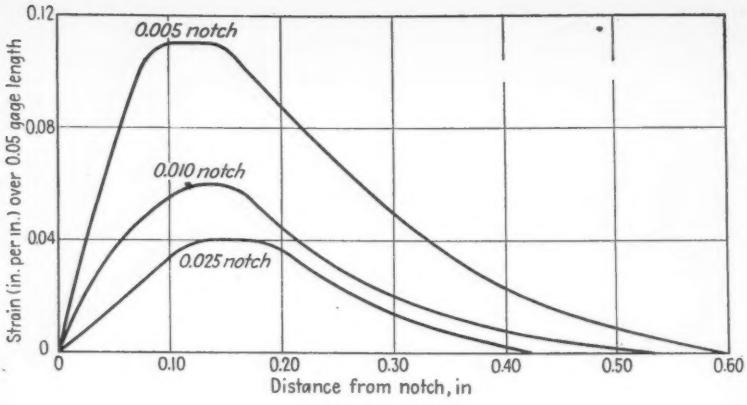


FIG. 7—Curve showing relationship between limiting strain and notch depth of 14S-T at room temperature and 14S-T at 350°F.

TABLE II

Indexes of Stress Notch Sensitivity and Factors Relating Notches and Materials

Notch Designation	Stress Notch Sensitivity Index			Relative Index Factor Compared with Notch No. 1			Average Per Notch Type	Relative Index Factor Compared with 14 S-T		
	14 S-T	75 S-T	24 S-T	14 S-T	75 S-T	24 S-T		14 S-T	75 S-T	24 S-T
1	0.22	0.28	0.46	1.0	1.0	1.0	1.0	1.0	1.27	2.09
2	0.28	0.30	0.68	1.27	1.07	1.48	1.27	1.0	1.07	2.43
3	0.37	0.45	0.73	1.68	1.61	1.59	1.63	1.0	1.22	1.97
4	0.50	0.70	1.26	2.27	2.50	2.74	2.50	1.0	1.40	2.52
5	0.66	0.84	1.40	3.00	3.00	3.04	3.01	1.0	1.27	2.12
						Average per grade.....		1.0	1.25	2.22



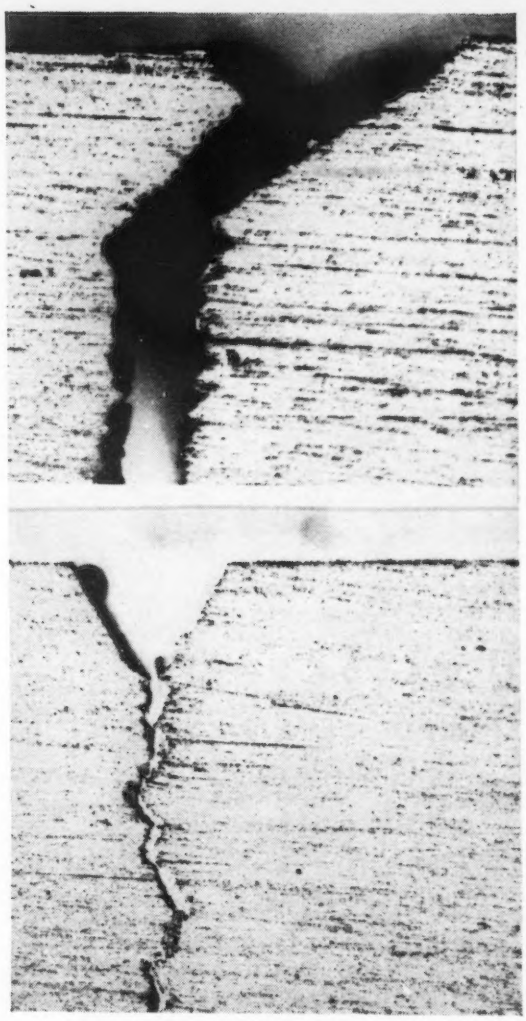
ABOVE

FIG. 8—Curve showing strain distribution of a notched specimen.

o o o

RIGHT

FIG. 9—Complex stress state under notch is evidenced by type of fracture. The 75S-T bar bent at 250°F with a 0.010 in. deep notch shows a sliding, shear fracture from the notched root (upper photo); the same bar with a 0.025 in. notch, fracture progresses straight down from the notched root in a square, brittle failure (lower photo).



and with a central slot (fig. 4). Full section spar caps with unloaded bolt holes were tension loaded to failure. A comparison of the relative efficiencies of the various sections shows 14S-T to be less stress notch-sensitive than 75S-T material.

The lower stress notch-sensitivity of 75S-T material does not preclude the use of this desirable higher strength alloy in tension loading applications. Rather, this knowledge enables the proper use of the higher strength material by adequate section thickening in the region of section discontinuities (holes or notches).

Strain Notch-Sensitivity

The effect of a notch on strain characteristics is illustrated in fig. 5 for 2 in. elongation of notched tension specimens. The greater ductility loss in 14S-T and 75S-T than in 24S-T contrasts with the relative stress notch-sensitivities of these alloys. This relative order of strain notch-sensitivity is further substantiated by measurements of limiting strain in bending ½-in. square notched bars supported by 1½-in. radius rollers 5 in. apart. Strain on the tension surface was measured from a 100 line-to-the-inch photogrid. The greatest strain that had been attained from the notch was taken as the "limiting strain" or fabrication limit for that particular operation and notch condition. For the same root radius notch, fig. 6 compares 24S-T and 75S-T and indicates less strain notch-sensitivity for the 24S-T material. The improvement in strain characteristics with elevated temperature forming is indicated in fig. 6 for 75S-T material and in fig. 7 for 14S-T material (not included in fig. 6 because of a different notch root radius).

An evaluation of strain notch-sensitivity may not be adequately indicated by figs. 5 and 6 in view of the following considerations: The distribution of strain along the surface of an unnotched bar bent to fracture is such that the region of greatest strain is directly adjacent to fracture. The distribution of strain along the surface of similar bars with notches is shown in fig. 8. For these there is zero strain at the edge of the notch, and this zero strain in the notch shoulder has an important effect upon the stress state at the notch root.

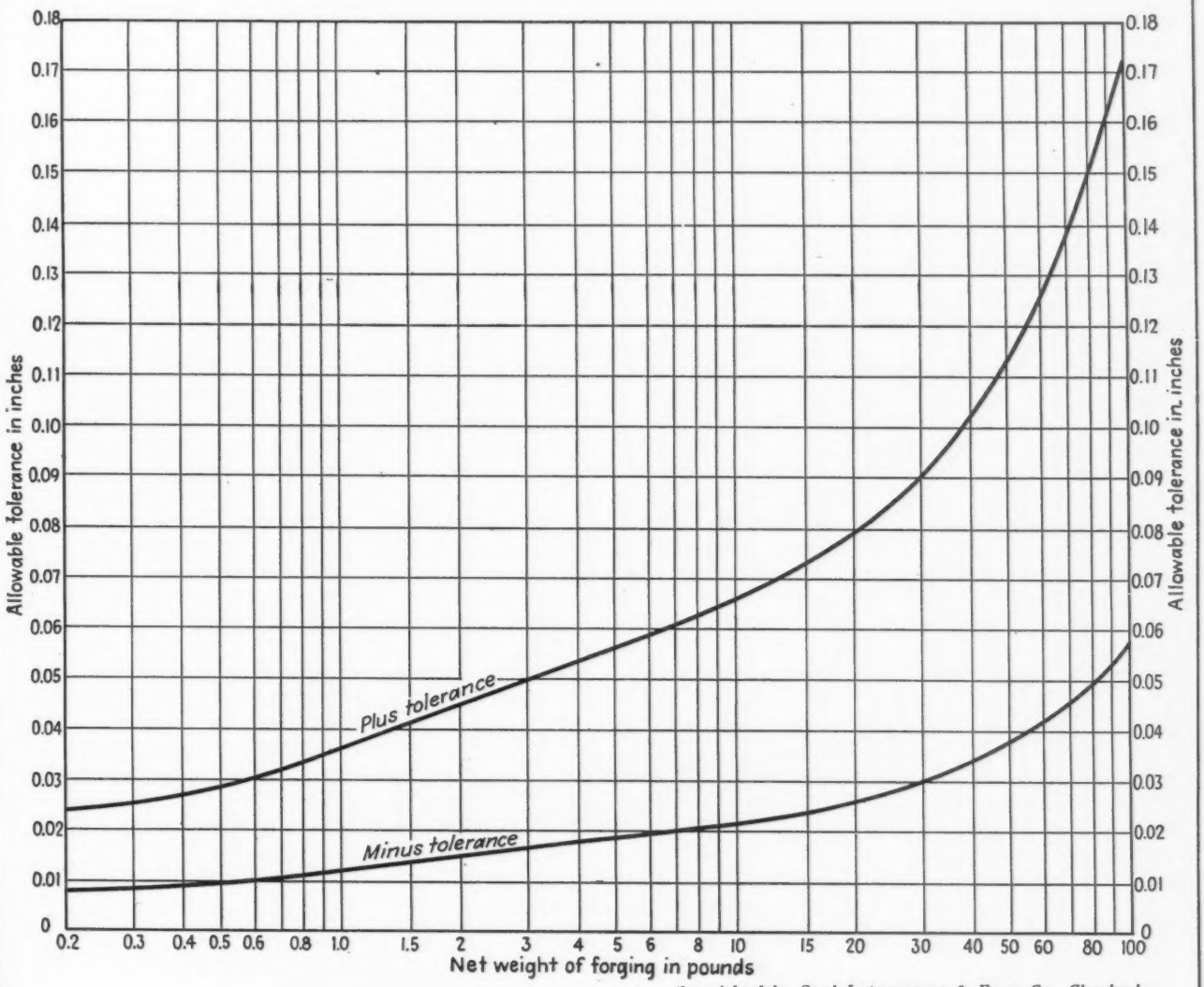
Normally, when a bar is bent, the material on the tension side of the bend contracts laterally to preserve constant volume, so that the cross-section changes. When there is a notch in the tension surface of the bar, however, the unstrained material in the shoulder of the notch does not contract laterally and tends to restrain the highly-stressed material at the notch root. Thus, the notch shoulder produces an increased lateral stress.

The complex stress state under the notch is also evidenced by the types of fracture. For example, in fig. 9, the 75S-T bar bent at 250°F with a 0.010-in. deep notch shows a sliding, shear fracture from the root of the notch. For an identical bar with a 0.025-in. notch, the fracture progresses straight down from the root in a square, brittle failure. The only apparent explanation for this difference in fracture appearance is that the increased notch depth results in higher induced secondary stresses beneath the notch, and that these increased secondary stresses in turn change the conditions of rupture.

Since a significant part of the notch effect is found in the triaxial stresses it produces, it is clear that the effect of the notch will vary with the triaxiality already existing in the member. Conclusions drawn from the effect of notches in bending square bars can therefore be extended to other cases of bending, only with caution. For instance, the lateral restraint of the notch shoulder, though important in the tests just described, would not influence the bending of wide sheet where there is already complete lateral restraint.

Calculating Commercial Tolerances For Impression Die Forgings

COMMERCIAL tolerances for closed impression die forgings of any style, shape or weight up to 500 lb may be quickly and accurately determined by use of the chart presented herewith. This chart, developed and copyrighted by Steel Improvement & Forge Co., Cleveland, is believed to be the first chart of its kind. Forging tolerances shown below apply to all dimensions of thickness, width and length where the length does not exceed the sum of the thickness and width by more than two times. Where the length is more than twice the sum of the thickness and width, it is necessary to add plus and minus 0.003 in. to the length tolerance for each inch of excess length. Examples of the use of this chart are given below.



Copyrighted by Steel Improvement & Forge Co., Cleveland

HOW TO USE THE CHART:

EXAMPLE A—A cylinder is 2 in. diam by 6 in. long and weighs 5 lb. The width and thickness tolerances at 5 lb on the chart are + 0.057 and — 0.019, or, in nearest fractional dimensions, the width and thickness tolerances are + 1/16 in., — 1/64 in. The length of 6 in. is less than two times the sum of width and thickness (2 in. width + 2 in. thickness) x 2 = 8 in. Therefore, + 1/16 in., — 1/64 in. applies for all dimensions.

EXAMPLE B—A forging is 1 in. thick by 3 in. wide and 14 in. long and weighs 12 lb. From the chart the width and thickness tolerances are + 0.069 and — 0.023. Twice the sum of the width and thickness is (1 + 3) x 2 = 8 in. Excess length (14 — 8) = 6 in.; tolerance for excess length = 6 x 0.003 = 0.018. Adding 0.018 to + 0.069 in. = + 0.087 in. Adding — 0.018 to — 0.023 in. = — 0.041 in. The length tolerance is + 0.087, — 0.041. In nearest fractions, the width and thickness tolerances are + 1/16 in., — 1/32 in., and length tolerances are + 3/32 in., — 3/64 in.

Characteristics of Three High

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DURING the war years and continuing through the present, Allegheny Ludlum Steel Corp. research laboratories have worked steadily on the problem of producing alloys possessing properties requisite for operation at the hitherto unbelievable temperature and stress conditions to which the moving parts of gas turbine power plants are subjected. During the war the urgency of the hour was to develop steels for turbojet aircraft power plants. Now, although the need for materials for this same type of power plant continues, but without the need for haste, a related field of need and opportunity exists in the development of gas turbine power plants, both stationary and mobile. This field includes marine engines for naval ships and the powdered coal-burning, gas turbine powered locomotive.

As the research work progressed, hundreds of different laboratory heats were melted and tested. The effect on elevated temperature mechanical properties of minor chemical composition changes, and of variations in the percentage rates of one element to others, was determined. From this mass of test data, three alloys, designated as S-588, S-590 and S-816, have emerged as materials of proven worth. Typical compositions of these alloys are listed in table I.

Some previous articles on high temperature alloys, published in THE IRON AGE, *are "16-25-6 Alloy for Gas Turbines," Jan. 17 and Jan. 24, 1946; "High Temperature Alloys," May 23, May 30, June 6 and June 20, 1946; "Alloys for High Temperature Service," Nov. 7 and Nov. 14, 1946.*

A rough range of values and relationships between several major classes of alloys in two major high temperature physical properties—creep rate and stress-rupture values—has been previously published.[1] It will be noted that the three "S" superalloys are included in group B wrought alloys, and in precision cast form in group C.

These three alloys present to the turbine producer a desirable latitude of choice of materials to meet a range of strength requirements at temperatures from 1200° to 1500°F. By selection of one of the three, the least expensive alloy to meet the output requirements can be chosen.

The designer of gas turbines must base his choice of alloys, in the initial selection, upon results of elevated temperature physical tests, such as stress-to-rupture strength, creep strength, endurance limit, and damping capacity. In addition, oxidation and corrosion resistance to minimize scaling and attack by the products of combustion of the fuel used are prime requirements. Short time high temperature tensile test results are of interest not only to the research metallurgist as a quickly available indication of the possible merit of new alloys for high temperature service, but also as a rough indication of hot working properties. Room temperature tensile properties are useful chiefly as an indication of cold working properties, but also as insurance of satisfactory mechanical properties during starting periods.

Coefficients of thermal expansion are, of course, important data, particularly with respect to calculation of proper clearances and tolerances in constructional details. They have been determined accurately in the range from room temperature to 1800°F and vary for the three alloys, in the temperature range of 70° to

TABLE I

Typical Analyses of Alloys S-588, S-590 and S-816[1]

Alloy	C, Pct	Si, Pct	Mn, Pct	Cr, Pct	Ni, Pct	Co, Pct	Mo, Pct	W, Pct	Co, Pct	Fe, Pct
S-588	0.45	0.37	0.48	19.38	19.76	—	4.16	4.07	3.84	Balance
S-590	0.43	0.66	1.65	20.88	19.42	19.31	4.33	3.93	3.92	Balance
S-816	0.38	0.39	0.49	19.84	20.17	42.28	4.30	4.26	3.77	4.09

[1]—Data from OSRD reports for NDRC

TABLE II

Logarithmic Decrement for Maximum Nominal Bending Stress of 25,000 psi[1]

Heating, °F	Damping Capacity
70	0.0029
900	0.00088
1200	0.0015
1500	0.011

[1]—Data from OSRD reports for NDRC

Temperature Alloys . . .

Superalloys S-588, S-590 and S-816 have, according to the author, emerged as materials of proven worth from the large mass of alloys tested for high temperature service. The three alloys are compared with one another from the standpoint of cost, physical properties and methods of fabrication, heat treatment and machining, to aid in the selection of the alloy most suitable for the purpose intended. Use of vibration of tuning fork samples as the most accurate criteria for modulus of elasticity measurements is also suggested.

1800°F, from 8.3 to 9.1 x 10^{-6} per °F, as compared to a coefficient of 10.9 x 10^{-6} for 18-8 stainless steel in the temperature range of 68° to 1832°F.

Damping capacity of the three alloys, in common with all alloys for similar service, be they cobalt base or austenitic, iron base, is low. The values listed in table II, determined on a S-588 tuning fork sample water quenched from 2250°F and aged for 50 hr at 1500°F, are typical.

Modulus of elasticity values at elevated temperatures as determined from creep loading tests is erratic. Values of 16 x 10^6 psi and 15 x 10^6 psi at 1400°F have been determined by this procedure for S-590 and S-816, respectively, as compared to room temperature moduli of 29 to 30 x 16^6 psi. It now appears that relative moduli, as determined by observation of the relative frequency of vibration of tuning fork samples, give more accurately reproducible values which, however, are considerably higher than those determined by the creep loading method. Relative moduli for S-588 and S-590 are shown in table III.

[1] The Iron Age, *Nov. 7, 1946, p. 51.*

Details of stress-to-rupture testing and creep testing have been described in numerous articles. The former tests do not eliminate the need for creep testing, but fill a need for high temperature strength data for designs, such as aircraft turbojet engines, in which the minimum service life is well below the long periods applying to creep rates. Stress-to-rupture values can be determined much more rapidly than can creep rates, which is to the credit of the newer tests.

A high endurance strength is desirable in any design, but the importance of high fatigue resistance is greater in long, slender blades in which there is a tendency toward vibrational stresses. This is equally true of damping capacity, the ability of a material to dissipate vibrational stresses. Most high temperature fatigue values have been determined on equipment designed by either Westinghouse Electric Corp. (formerly Westinghouse Electric & Mfg. Co.), or General Electric Co., the former machine inducing vibration of the specimen electrically; the latter by pneumatic means. Either machine can be adapted to test shapes other than standard test pieces such as finished turbine buckets.

To the builders or designers of gas turbines or other equipment incorporating high temperature alloys, the details of microstructure are relatively unimportant. Their chief concern is first with laboratory high-temperature test data. This is followed by relation of those data to the desired properties of finished assemblies as influenced by design details and fabricating techniques, and finally with the proof of the alloy in actual service tests of completed equipment.

To the metallurgical departments of the alloy producers and of the users, however, microstructure is of considerable importance as a guide in the development of new analyses and proper heat treatments. Because of the complex analyses of these three alloys, the exact nature of the microconstituents must be assumed. It is probable that the matrix of the structure is a solid solution of iron-chromium-nickel-cobalt in S-590 and S-816, and nickel-chromium-iron in S-588, plus some of the other elements, in which are probably present complex carbides of tungsten, molybdenum

TABLE III

Relative Modulus of Elasticity

Temperature, F	S-588 Heat Treated	S-590 Heat Treated
70	1.00	1.00
900	0.85	0.86
1200	0.80	0.81
1500	0.75	0.74

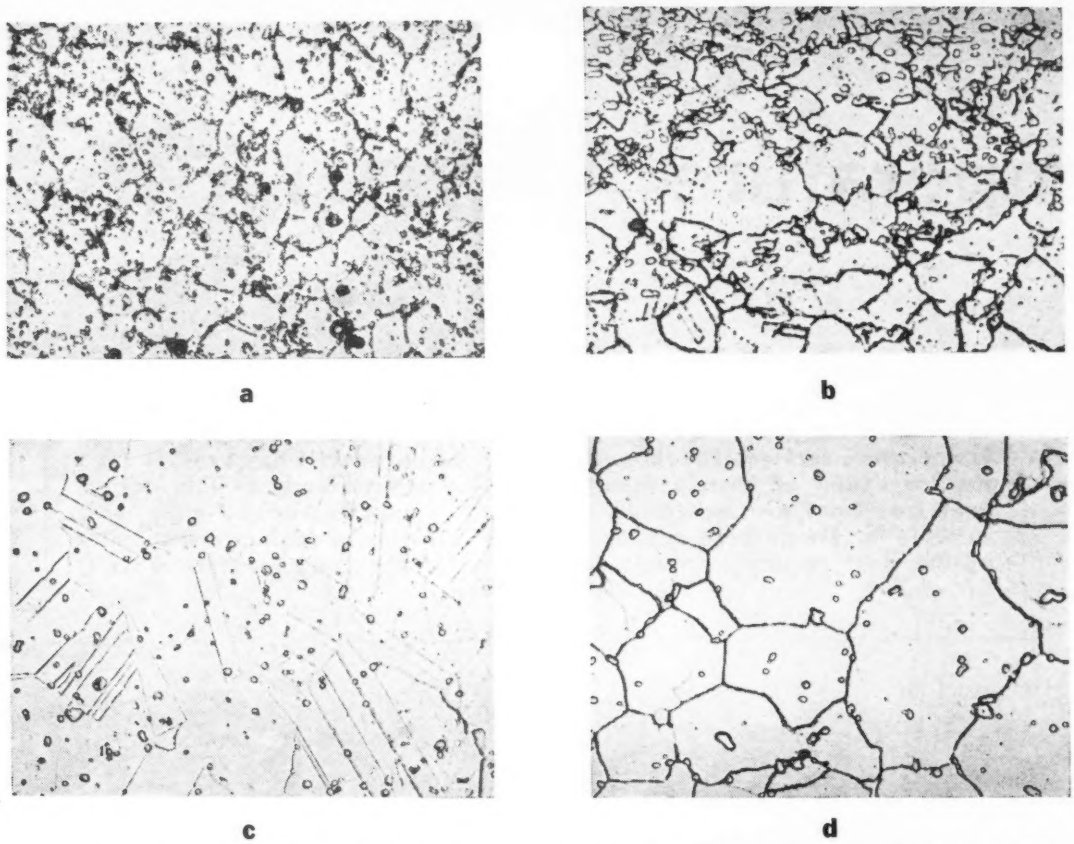


FIG. 1—Photomicrograph of alloy S-816 (a) as-forged; (b) as hot-rolled; (c) as hot-rolled, solution treated 1 hr at 2300°F and water quenched; (d) as hot-rolled, solution treated 1 hr at 2300°F, water quenched, aged for 16 hr at 1400°F, air cooled. 500X

and columbium and possibly tungstides, molybdides and columbides.

The microstructures of all three alloys, ranging from the ferrous base S-588 to the cobalt base S-816, are very similar in appearance. Fig. 1 shows typical microstructure of S-816; (a) as-forged, (b) as hot-rolled, (c) as hot-rolled and solution treated, and (d) as hot-rolled, solution treated and aged. Fig. 2 shows the structure of cast S-816 in the as-cast condition.

While the alloys in the as-rolled state possess high temperature strength in excess of that of the common austenitic stainless steels, they are markedly improved through proper heat treatment. This consists basically of solution treatment at about 2150° to 2300°F, followed by water quench and aging at about 1400°F. Although not apparent from photomicrographs, it is inferred from physical test results that such treatment first causes maximum solution of carbides or intermetallic compounds, followed by their precipitation in finely divided particles. It is emphasized that the wrought alloys should be used only in the fully heat-treated condition. This is true because best properties are only so realized, and also to insure reproducible properties.

It has been found that the solution treating temperature has a marked effect upon high temperature strength. As would be expected, the higher the temperature, the larger the grain size and the higher the elevated temperature strength. This is clearly illustrated in fig. 3, relating to an early variation of S-588 of approximately 14 pct Cr content.

Unfortunately, with higher strength, high solution

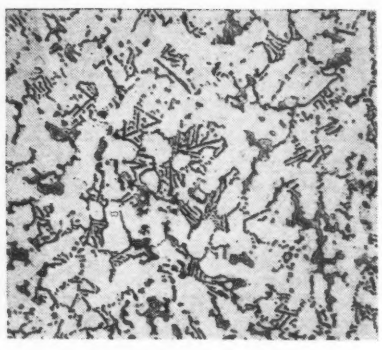


FIG. 2—Photomicrograph showing structure of S-816 alloy in the as-cast condition. 100X

TABLE IV

Creep Strength—1 Pct in 10,000 hr

1200°F	Creep Strength, Psi
Type 316 (18-8M) stainless	11,000
Alloy S-588 (low chromium)	16,000
1350°F	**Creep Strength, Psi**
Type 316 (18-8M) stainless	5,400
Alloy S-590	21,000
1500°F	**Creep Strength, Psi**
Type 316 (18-8M) stainless	2,000
Alloy S-588 (low chromium)	9,600
Alloy S-590	10,400
Alloy S-816	9,600

treating temperatures also induce a corresponding decrease in elevated temperature ductility. This phenomenon is not confined to these three alloys alone, but is common to all high temperature alloys.

Time at solution treating temperature is governed by the mass of the parts. Small sections such as turbine buckets require only about ½ hr at temperature, while large sections such as forged turbine wheels require up to 3 hr at heat. Water quenching from solution temperature is preferred to air or oil quenching. Aged hardnesses are higher the more drastic the quench, either because of acceleration of aging due to higher quenching strains, or because of increased amounts of carbides and intermetallic compounds held in solution.

Another factor determining the optimum solution treating temperature for a particular part is the phenomenon of excessive grain growth, which has been found to occur if the alloys are mechanically worked to a certain degree prior to solution treatment. It is thought that excessively large grain on the leading or trailing edge of a turbine bucket, for example, would have an adverse effect on high temperature properties, particularly fatigue. In S-816, for example, this excessive grain growth occurs only after very low order deformations of about ½ pct or less, followed by solution treatment at the higher side of the temperature range. Solution treatment at 2150°F does not result in excessive grain size after such critical deformation, and in parts where deformations of the critical degree are unavoidable this solution treating temperature is recommended. The critical deformations applying to S-588 and S-590, and the maximum permissible solution treating temperatures after such deformations, have not yet been accurately determined. In fairness, it should be clearly understood that such grain growth is not unique in these three alloys.

Earlier recommendations suggested aging at a temperature equaling the test or maximum service temperature, but since the effect of variation of aging temperature within the limits of 1350° to 1500°F is not marked, later practice is to age at 1400°F for a minimum of 10 hr, and usually 16 hr to insure complete aging.

Since the alloys scale heavily at solution treating temperatures, although quite oxidation-resistant at temperatures up to 1600°F, protective atmospheres are desirable. Carburizing atmospheres such as commonly used for tool steels must not be used, however, because the alloys would carburize rapidly at solution treating temperatures. Mixtures of nitrogen and hydrogen, cracked ammonia or mixtures of cracked ammonia and combusted gas are quite satisfactory. Solution treatment in a still-air atmosphere is permissible and deleterious only because of excessive scaling.

Fig. 4 shows comparative stress-rupture values as-tested at 1200°, 1350°, and 1500°F. The ranges in values indicated for each alloy reflect variations in testing conditions, heat treatment, mill processing, analysis, etc., and are representative of strength ranges to be expected in commercial processing. The range of values for several of the standard stainless steel austenitic grades is also shown for comparison.

Table IV shows the relation in creep strength at 1500°F between these alloys and AISI type 316, the chromium-nickel austenitic alloy of general usage having highest high temperature strength.

High temperature fatigue data have been determined to the extent indicated in table V, and addi-

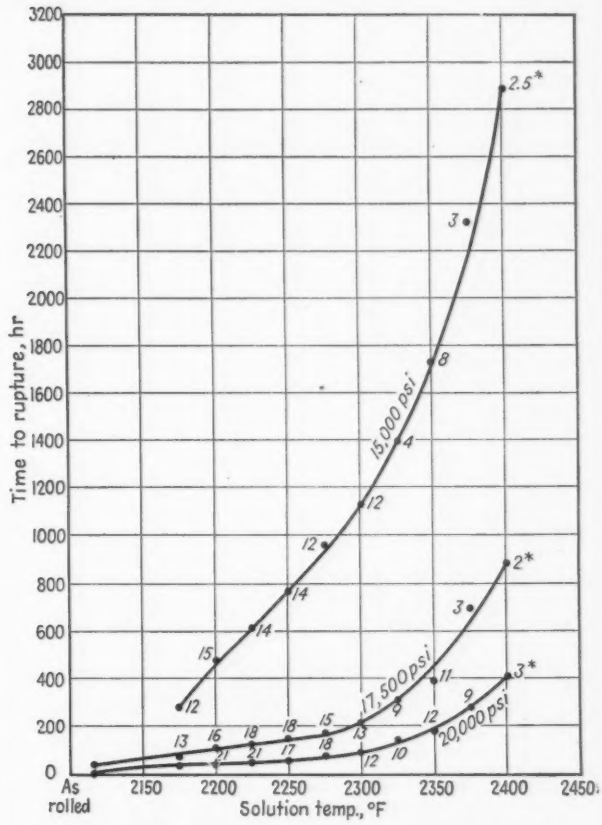


FIG. 3—Time to rupture v. solution temperature of alloy S-588 (low chromium). Alloy water quenched after 1 hr at heat; aged for 16 hr at 1500°F. Tests made at 1500°F. Asterisks denote corresponding percent elongation values.

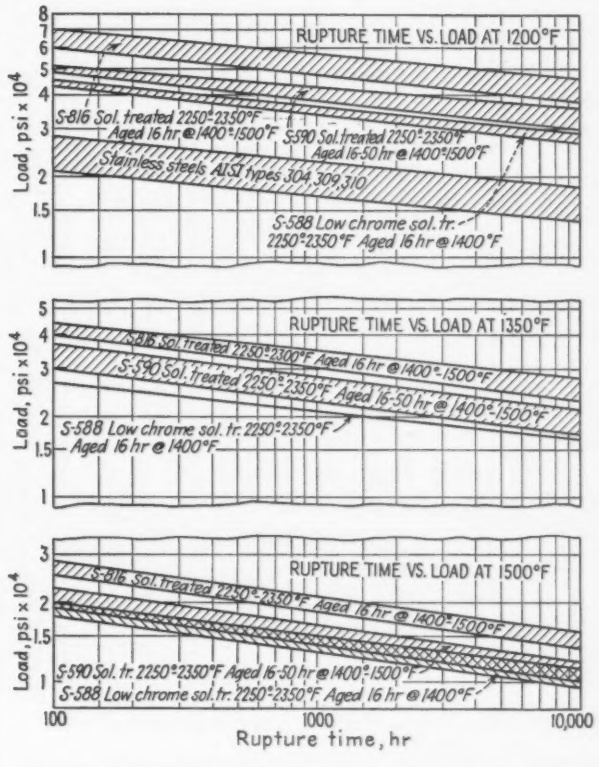

RUPTURE TIME VS. LOAD AT 1200°F
S-816 Sol. treated 2250°-2350°F Aged 16 hr @ 1400°-1500°F
S-590 Sol. treated 2250°-2350°F Aged 16-50 hr @ 1400°-1500°F
Stainless steels AISI types 304, 309, 310
S-588 Low chrome sol. fr. 2250°-2350°F Aged 16 hr @ 1400°F
RUPTURE TIME VS. LOAD AT 1350°F
S-816 Sol. treated 2250°-2300°F Aged 16 hr @ 1400°-1500°F
S-590 Sol. treated 2250°-2350°F Aged 16-50 hr @ 1400°-1500°F
S-588 Low chrome sol. fr. 2250°-2350°F Aged 16 hr @ 1400°F
RUPTURE TIME VS. LOAD AT 1500°F
S-816 Sol. treated 2250°-2350°F Aged 16 hr @ 1400°-1500°F
S-590 Sol. fr. 2250°-2350°F Aged 16-50 hr @ 1400°-1500°F
S-588 Low chrome sol. fr. 2250°-2350°F Aged 16 hr @ 1400°F
Load, psi x 10⁴
Rupture time, hr

FIG. 4—Rupture time v. load at 1200°F, 1350°F, and 1500°F.

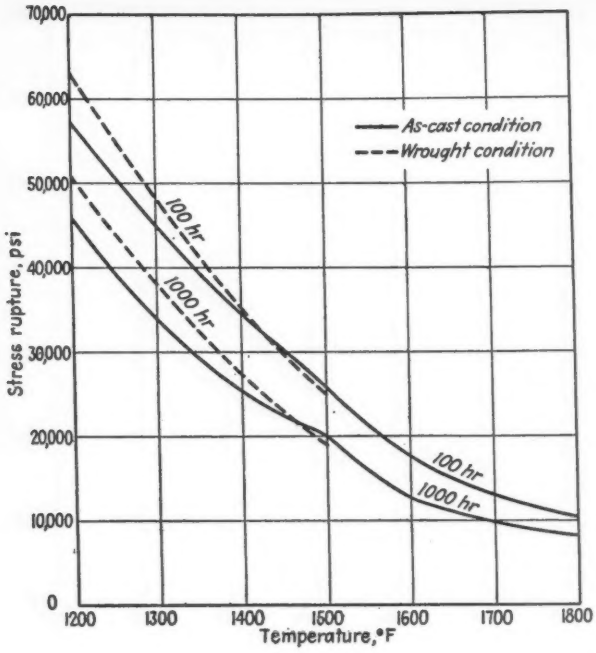


FIG. 5—Comparative stress rupture data of cast v. wrought S-816. Wrought alloy solution treated at 2250° to 2300°F, water quenched, aged 16 hr at 1400° to 1500°F.

tional samples are being tested to give a more complete picture of endurance properties as affected by grain size, prior heat treatment, etc.

These alloys are hammer forged starting from 2250° to 2300°F, and drop forged starting at about 2150° to 2200°F. To reduce scaling loss, controlled atmosphere heating is recommended as in solution treatment. Hot working requires sturdy equipment and comparatively high power, as would be expected considering the high temperature strengths, but with adequate equipment volume production is possible. Advanced procedure in forging buckets is upsetting, then press forging, followed by one or two finishing blows on the drop hammer.

Machining, as would be expected due to the initial high hardness as well as a rapid work-hardening rate comparable to that of the austenitic stainless steels, must be done slowly, and tool life is short. Machining problems are similar to those encountered in working the more common austenitic steels, and similar practices such as use of sulfurized cutting oils, reduced speeds, continuous cutting without "glazing," and sharp tools, are desirable. The best all-around condition for machining appears to be a partially-aged state as produced by holding solution-treated stock for 1 to 2 hr, at 1400°F. Speeds in turning of 10 to 15 sfpm, using high-speed tools, have been satisfactorily attained. Drilling is the most difficult operation; the deeper the hole, the greater the difficulty encountered with chip removal. Holes ⅛ in. in diam are successfully drilled 1¼ in. deep by withdrawing the drill about every ⅛ in. of depth for about the final ¾ in. of depth to effect chip removal. Speed of drilling must be slow for a ½-in. hole = 5 to 8 sfpm is practicable.

The characteristics of welded joints in these alloys are so dependent on the design of the joint that it is difficult to assemble any basic data of value.

TABLE V

Endurance Limit—10^8 Cycles

1200°F	Endurance Limit, Psi
Alloy S-588 (low chromium)	41,500
Alloy S-816	68,000
1500°F	**Endurance Limit, Psi**
Alloy S-816	33,000

TABLE VI

Tensile Results on Tests Taken Across Weld in an Atomic Hydrogen Welded S-816 Tube—0.135 In. Thick

	Hardness, Rc	Tensile Strength, Psi	Pct Elong., in ¼ in.	Pct Elong., in ½ in.	Pct Elong., in 1 in.
Annealed 2250°F for 15 min; air cooled	32	133,000	0.8	1.0	10.0
Annealed 2250°F for 30 min; air cooled	25	128,000	20.0	14.0	8.0
Annealed 2250°F for 45 min; air cooled	22	137,000	32.0	26.8	24.0

TABLE VII

Tensile Results on Tests Taken Across Weld in an Arcwelded S-816 Sheet 0.125 In. Thick—Coated S-816 Electrode

Condition	Hardness, Rc	Yield Strength, Psi (0.2 pct Offset)	Tensile Strength, Psi	Pct Elong., in 2 in.	Pct Elong., in ½ in.
As-welded	34.5	88,000	146,000	10.5	14.0
As-welded; weld ground flush	....	87,000	133,000	5.0	10.0
As-welded; annealed at 2250° F for 4½ min	24-27	65,000	147,000	29.0	15.0
As-welded; annealed at 2250° F for 4½ min; weld ground flush	....	67,000	132,000	17.0	17.0
As-welded; annealed at 2250° F for 15 min; weld ground flush	25.0	65,000	128,000	15.0	20.0
As-welded; annealed at 2250° F for 30 min; weld ground flush	21-23	60,000	127,000	19.0	24.0

Tables VI and VII, however, listing tensile properties of welds in S-816 sheet as welded by atomic hydrogen and by electric-arc methods respectively, are of interest, illustrating brittleness of such welded structures as welded, and the substantial recovery of ductility through solution treatment.

In different assemblies all of the usual methods of fusion welding including electric arc, Heliarc, atomic hydrogen and submerged arc have been used satisfactorily. Welding of buckets of these alloys to the turbine wheel which may be of a different composition such as 16-25-6 Timken alloy, or 19-9 DL, has utilized type 316, 19-9 DL, or 17W rod without heat treatment after welding, the less highly alloyed filler rods affording greater ductility of weld metal than when using filler metal of S-588, 590 or 816 analysis. Preheating at temperatures up to 800° or 900°F is usual to prevent underbead cracking.

The discussion until now has concerned wrought alloys only, most of the tests to date having been conducted on rolled or forged alloys. Volume production of the most noteworthy applications to date, namely S-816 in GE engineered TG-100 and TG-180 blades,

and S-590 in Elliott Navy marine turbines, has utilized, respectively, forged blades and blades machined from bar stock.

These alloys are readily cast, however, and, in the case of S-816, in the cast form, possess properties of approximately the same order as do the superalloy grades normally used only in the cast state. As with all alloys of the superalloy classification, at temperatures under approximately 1500°F, the alloys in wrought form exhibit superior strength, while over about 1500°F the alloys in cast form have greater strength. Comparative tests indicate a superiority of the wrought form insofar as fatigue is concerned.

Fig. 5 gives comparative stress rupture data of cast v. wrought S-816.

With reference to values at temperatures over 1500°F, it should be noted that elevated temperature strength declines more rapidly over about 1500°F. This effect is presumably because of coalescence of precipitated particles (overaging), the room temperature hardness of samples aged at over 1500°F being appreciably lower than that of samples aged at 1500°F, as indicated by table VIII on S-590.

TABLE VIII

Hardening Series of Wrought S-590

Condition	Bhn	Rc
(1) 2300° F; water quench	241	20-22
(1) Plus 16 hr 1300° F; air cool	255	24-26
(1) Plus 16 hr 1400° F; air cool	269	25-27
(1) Plus 16 hr 1500° F; air cool	302	30-32
(1) Plus 16 hr 1600° F; air cool	293	29-31
(1) Plus 16 hr 1700° F; air cool	269	24-27
(1) Plus 16 hr 1800° F; air cool	269	24-26

Since there is little improvement effected by solution treating and aging the cast alloys, they are generally tested and used in the as-cast condition.

As with all forms of high temperature alloys, the exact details of processing and treatment influence high temperature physical properties and details of casting technique must be varied depending upon blade design. At present, considerable attention is being paid to the effect of mold temperature v. metal temperature at casting time, and experimental work investigating this relation in S-816 alloy is under way.

The designer's decision as to whether a wrought or a cast part will be used is influenced by a number of factors in addition to the primary comparison of physical properties. Most important is the comparative ease of production and consequent cost of the part in question, by casting v. forging or machining from bar stock, and the comparative soundness of finished parts. Costs are influenced by a number of factors, that of yield in castings and of die costs in forgings being two of the most potent. Comparison of cast v. wrought parts is in all respects more favorable to castings, the smaller the part.

Although all commercial production in these alloys (heat sizes from 2 to 10 tons) has been as bars and forgings, experimental quantities of sheet, wire and welded tubing have been produced.

Of interest, indicating workability of the alloys, are tables IX and X showing bend test results on S-590 and S-816 and the effect of cold reduction on the room temperature mechanical properties of S-816.

TABLE IX

Bend Test Results[1]

Test Sheet Solution Treated @ 2180°F and Air cooled—Angle of Bend, 180°

Grade	Thickness, In.	Yield Strength, Psi	Tensile Strength, Psi	Pct Elong., in 2 in.	Diam. of Bend, In.
S-816	0.060	78,880	147,840	27	0.115
S-816	0.060	77,190	149,400	28.5	0.115
S-816	0.060	80,910	149,200	27.5	0.115
S-816	0.060	80,760	150,550	31.5	0.115
S-816	0.037	71,540	142,820	29.0	0.040
S-816	0.037	70,520	146,110	32.0	0.040
S-816	0.037	72,340	147,470	35.5	0.040
S-816	0.037	71,110	145,810	33.0	0.040
S-590	0.048	68,770	124,280	37.0	0.050
S-590	0.048	68,400	125,100	35.0	0.050
S-590	0.048	68,720	125,570	32.0	0.050
S-590	0.048	66,750	125,160	34.5	0.050

[1] Tests were bent until cracking began and the angle and the diameter of the bends were measured. The diameter of the bends may be smaller than that reported due to the slight spring back which results when the pressure is removed from the vise.

A few stress-to-rupture tests on S-816 sheet as solution treated and aged and as solution treated plus cold reductions of 5 and 15 pct, plus aging, have been run, but the data are not sufficiently complete to permit publication. The indication is, however, that stress rupture loads on cold-reduced and aged samples approximate those on samples which had no cold reduction although exhibiting appreciably lower ductility. Results approximate values determined on bar stock specimens.

Figs. 6 and 7, showing the effect of temperatures and of time at temperature on the room temperature hardness of cold-drawn high tensile wire in these

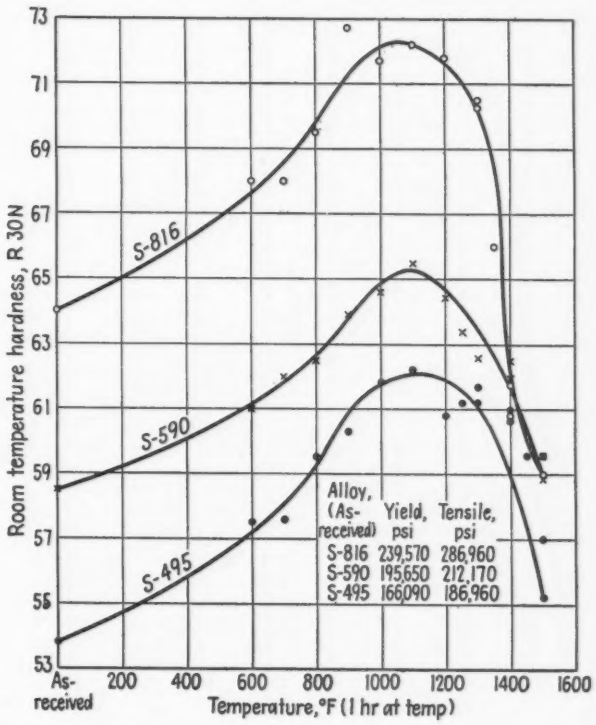


FIG. 6—Effect of temperature on high temperature alloys S-495, S-590 and S-816 in respect to hardness. Wire (0.121 in.) cold drawn.

TABLE X

Physical Properties of Alloy S-816

Condition	Yield Strength, Psi	Tensile Strength, Psi	Pct Elong., in 2 in.
Annealed	85,040	156,000	30.5*
	85,140	155,940	30.0
15.7 Pct C.R.	149,460	181,390	25.0
	145,800	177,790	18.0
30.0 Pct C.R.	189,600	216,310	9.0
	191,590	218,410	7.0
45.2 Pct C.R.	208,020	244,110	4.0
	213,170	244,670	2.0*

* Broke short.

alloys, suggest the interesting possibility of their use as spring wire for operation at temperatures up to about 1200°F.

It is much too early to adopt a complacent attitude concerning these alloys. Despite their service-proved performance and excellent standing in comparison of all-around elevated temperature physical properties with others of the superalloy class, there is no assumption that all is known relative to their properties and proper handling or that they are necessarily the ultimate answer to the requirement for metals to operate at high stresses at elevated temperatures.

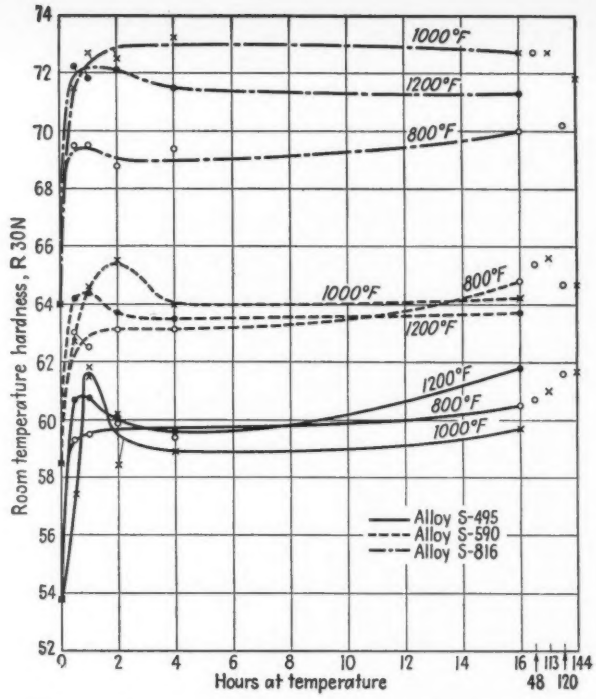


FIG. 7—Effect of time at temperature on hardness of high temperature alloys S-495, S-590 and S-816 in respect to hardness. Wire (0.121 in.) cold drawn.

Carbon Hearths for Blast Furnaces

USE of carbon as blast furnace hearth material was discussed in the paper "A design for Blast Furnace Hearths," by W. S. Unger, consulting engineer, blast furnaces and coke ovens, Carnegie-Illinois Steel Corp., Pittsburgh, at the recent general meeting of the American & Steel Institute in New York. The paper also discussed blast furnace hearth design in general, pointing out good and bad points in hearth design.

In discussing the carbon hearth, the author stated that carbon construction costs about five times that of ordinary firebrick. Unfortunately, the life of sufficient linings has not been determined to form a definite conclusion as to the merits of this type of construction. However, even at this increased cost, carbon seems to offer considerable promise.

Carbon blocks are being used in many of the more recent furnace bottoms in an attempt to reduce the epidemic of breakouts which have been occurring on furnaces that have been in blast only a short time. It is stated that carbon blocks are impervious to slag and iron, have a low thermal expansion, and are not affected by any temperature encountered in the blast furnace. However, above 800°F they are oxidized by the oxygen in the air. The usual construction is to install two courses of carbon blocks, each about 22½ in. in depth, 30 in. in width, and up to 50 ft in length, running parallel to the center line of the iron notch and having a longitudinal 2 in. space between the sides of the blocks for tamping with carbon paste. The carbon block expands on heating while the paste contracts to a point and then expands upon further heating so that with a properly proportioned packing space, a tight bottom is obtained at all times. The top, bottom and ends of each block are machined while the sides are not. The end of the block extending inside the furnace is dovetailed to prevent floating of the center block, where one is used, and the other end of the block is held by the weight of the sidewall of the hearth, thus tending to form a cantilever. For several feet on either side of the iron notch the blocks are laid tight against the cooling stave, but around the remainder of the circumference the blocks are held approximately 3 in. away from the hearth cooling stave and the annular space packed with specially prepared tarred coke braize.

The blocks forming the sidewall consist of two courses and usually extend upward to the center line or to bottom of the cinder notch. The 2-in. space between the inside and outside course is packed with tamped carbon paste, and the space between the outside course and the tuyere jacket with tamped tarred coke braize.

One manufacturer does not machine the tops and bottoms of the large carbon hearth blocks but relies on bedding the blocks into a layer of carbon paste to take up any irregularity. He also recommends the use of an annular ring of brick between the cooling staves and the carbon blocks to act as an insulator.

Other applications of carbon have been the use of an annular carbon ring around the cinder notch cooler and tuyere coolers, the lining of the main iron trough with carbon brick, the use of a crescent-shaped piece of carbon on the bottom of the cinder notch cooler over which the cinder runs, and the lining of the splasher plate with carbon brick. It has been found that cooling the carbon immediately after using, where it is exposed to the air, prolongs the life and does not crack the carbon due to thermal shock.

How to Use Carbide Cutters for Milling

. . . Rating Carbide Milling Jobs

Because carbide milling varies so completely from conventional milling with high speed cutters, an entirely different method of establishing optimum rates of metal removal must be employed. How to establish these rates for different types of jobs is explained in a simple step-by-step procedure, in this article, the 15th of a series on carbide milling. A small, flimsy, cast-iron workpiece and a large block of stressproof steel are used as practical examples, and the rates for each are worked out in detail.

By H. A. FROMMELT
Consulting Engineer,
Chicago

UNTIL recently the major limitation in removing metal resided in the cutting material. Horsepower available in machine tools was used seldom to more than 50 pct of capacity rating, and these ratings were based largely on the overall physical dimensions of the equipment. It was seldom that even hogging cuts required all the power in the machine tool.

Now all that is changed with the advent of carbides for milling and the development of a suitable technique to remove metal with multitoothed cutters. The limiting factor in moving metal from a component is no longer in the cutting material, rather it is now only to be looked for in the workpiece itself. On the assumption that the machine tool builder has provided spindle powers that are considered both good engineering and good economics of metal removal, the productionist need only look for the limitations in the component before him, or better still, in its blueprint that should be carefully studied before production scheduling or machining operation is undertaken.

Actually the limitations are more numerous, particularly if milling operations are performed with good modern equipment but which has not been designed for the streamlined technique of metal removal. These will be considered in detail and will serve as the basis for laying down a radically new and yet necessary method of rating carbide milling jobs.

Since an 8-in. diam. face mill, both in the solid carbide blade and brazed tip design, has been operated on a 50 hp milling machine at 90 hp output without evident signs of distress and, indeed, at excellent cutter life determinations, the limitations to getting metal off components according to specifications must be sought for elsewhere. It can be found in the following factors: (1) Workpiece characteristics such as cross-sectional area, construction, holding facility, etc.; (2) finish and accuracy demanded by specifications; (3) horsepower in the machine.

The first and major limitation to the rate at which metal can be removed from a job should be looked for in the character, nature, design and construction of the piece itself. Obviously a workpiece with thin sections, that could not be designed with ribs and buttresses, presents a definite and inescapable reason for the productionist setting its rate in the lower brackets.

This is certainly true of the job shown in fig. 73, an air seal, that by its very functional design must be scheduled for the lower feed rates. Before discussing the actual rating for this job and the method used to arrive at this determination, it is pertinent to consider the rates at which the various engineer-

TABLE XIV

Recommended K-Factors for Commonly Used Materials

Material	K-Factor or hp per cu in. per min
Cast iron 25,000 to 40,000 psi	0.50
Cast iron 40,000 to 80,000 psi	0.75
Cast steel 50,000 to 60,000 psi	0.75
Steel, forged, rolled, similar to: SAE 1020, 180 to 200 Bhn	0.75
Steel, 200 to 250 Bhn	1.00
Steel, 250 to 300 Bhn	1.50
Aluminum and magnesium	0.10

ing materials can be milled with carbide using the best known carbide milling technique.

The so-called K-factor or the horsepower required to remove 1 cu in. of metal per min refers to the power at the spindle and hence is the net power called for in making chips. The shop, however, is concerned with the gross power called for by the milling machine at the motor. The difference between the two is the power lost in bearings and gear trains. In the older machine designs, it also represents the power required to feed the table of the milling machine carrying the workpiece into the cutter. This is seldom more than 5 pct of the power required at the spindle. In the latest designs the spindle and table drives have been separated and are now represented by two motors.

But the K-factor still remains the net horsepower required by the spindle to drive the cutter into the work and form the well-known figure 6 chips. In reporting on a practical system for the shop to follow, the data given in table XIV refer to the amount of power the production personnel should look for in the main motor to perform satisfactorily the operation in hand without a stalled machine and, therefore, a damaged cutter. These rates apply to good average machines, in good adjustment and maintenance, and equipped with carbide milling cutters of accepted design.

Rating a Small Job

It is now possible for production personnel to take the first step in properly rating a carbide milling job. If of cast iron in the first bracket given in the table then it is safe to schedule a job for metal removal at the rate of 2 cu in. per min for every horsepower available. Actually this rate can be stepped up to 3 cu in. and jobs are so scheduled; but a reasonable and conservative approach is 2 cu in. Briefly, the remaining rates, properly translated, mean that 1.3 cu in. of the controlled cast irons (50,000 psi and higher), the same for common run-of-the-mine cast and forged, or rolled, steel, can be moved each minute with each horsepower in the driving motor. As the materials increase in Brinell hardness, the amount of power required to machine them naturally increases. This is also recorded in the table. As for the nonferrous materials including the plastics, the rate of removal is fantastically high and, therefore, conversely, the horsepower rate is correspondingly low. The problem here is the power required to drive the spindle and table at the high speeds and feeds demanded, or at least possible, for these materials.

Returning again to fig. 73, and the method applied to the rating of this cast steel air seal, the information now available concerning the K-factor has first call. This material can be milled with a carbide cutter at an expenditure of ¾ hp for every cu in. that appears in the form of chips each minute. Or for every horsepower indicated on the motor plate 1.3 cu in. can be moved per minute.

As regards the workpiece itself, its sections are thin and its shape does not contribute either to stability while being milled or to effective holding. Obviously no great metal removal rate can be applied here. Experience indicates that not more than 12 to 15 cu in. of this workpiece can be removed each minute. Unfortunately, no guide other than experience can be applied in making this determination, and it does not seem likely that any tabulated data can ever be made available that will assist an armchair production manager. Experience and experience only can set the rate at which a job can be done, taking into account, for the time being, the design and construction of the piece itself. But this disadvantage need cause only a temporary slow-down in scheduling. The general rules laid down here will suffice for the beginner in this technique to set a safe removal rate and then creep up on the job.

FIG. 73—In rating small components that are lacking in rigidity and cannot be effectively clamped, the rate of metal removal must be substantially reduced below that allowable for heavier parts.

The air seal, it is now determined, cannot be milled faster than 12 to 15 cu in. per min; the sections average 0.375 in. in width, and 0.200 in. depth of metal is to be removed according to the blueprint. Thus the cross-sectional area of metal removed will be 0.750 sq in. If the 12 cu in. removal rate is selected, then the feed rate automatically becomes 16 ipm.

Next, the removal rate must be matched to the available power in the machine. This No. 3 milling machine has a 10 hp motor driving both table and spindle. The K-factor is 0.75 and the removal rate is 12; hence the horsepower needed is 9. This is sufficiently close matching of rate of metal removal and horsepower available; and the actual performance bears out its accuracy and adequacy.

The finish required is listed as 50 microinches. This is entirely possible at a 16-in. feed rate if the milling cutter blades are ground with a diamond wheel

and a zero dish angle is used with the zero line equal in length to the feed per revolution. This means that the length of the zero line on the face cutting side of the carbide blade must be 0.120-in. long. This is arrived at as follows: Since this workpiece is cast steel the surface foot rate should not exceed 350 fpm. Using an 8-in. diam cutter the spindle speed selected is 150. Since this mill has eight blades and the feed rate is 16 in. the feed per tooth is $16 \div 8 \div 150$, or 0.014 in. approx. Hence the feed per revolution will be 0.014×8 (since there are eight blades per revolution), or 0.112 in. For surety sake this is increased to 0.120 in. If these recommendations are followed, a finish better than specified will result.

It is interesting to note that the feed rate using high speed steel cutters on this job was 4 in.; the cutter life was increased from 100 to 200 air seals between grinds, and the grinding costs were reduced from 1¢ per unit of product to 0.1¢ by the application of carbide.

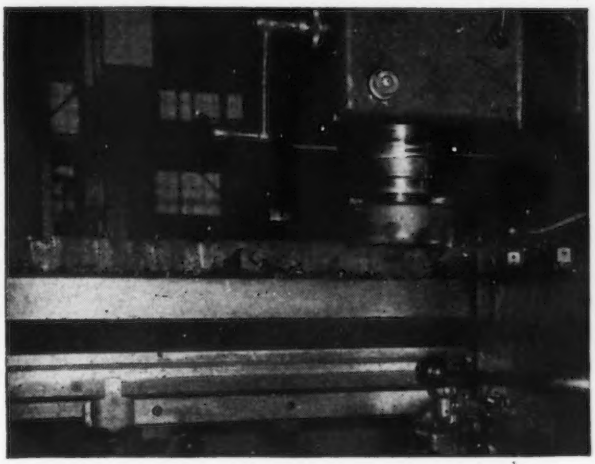


FIG. 74—For solid, massive workpieces such as that shown here, the maximum metal removal rate may be employed. The only limitation is the amount of power available in the machine tool.

To return again to the rating problem. This workpiece when it appears in blueprint form before the production personnel for sheduling is rated according to the following steps: (1) Thin sections and lack of stability inherent in the piece require holding down removal rate to 12 cu in. per min. (2) Specification calls for 0.200-in. depth of cut, and cross-section adds up to 0.75 sq in. of cut. This results in a feed rate (using 12 as removal rate) of 16 ipm. (3) The horsepower required, gross, for this operation is 9, which in turn matches the power available in the machine's driving motor. (4) Experience and, subsequently, the actual results, indicate that the 16 ipm feed rate will yield an entirely satisfactory surface condition. This is true of the profilometer determination as well as the surface plate check for flatness. This latter specification of accuracy is frequently a determining factor in rating carbide jobs.

The remainder of this discussion will concentrate on the essentials of carbide job rating in terms of actual operations. This is justified, it would seem, since the method or steps essential to good rating have been carefully detailed in terms of the first job discussed above.

The workpiece being milled as shown in fig. 74 is a member in the table of a large machine tool. Made of stressproof steel, its processing is performed on a large planer-type milling machine with a direct connected motor. These characteristics are important in the overall evaluation that precedes job rating. Here rigidity and stability are inherent in the job, the machine and the setup. The conditions are therefore ideal, and metal can now be scheduled for removal at the top rates.

The K-factor for this material is 0.8. This is the first important guide post on the road to correct rating of this job. There are no limitations in the workpiece, or its method and adequacy of holding. Experimentally, it has been determined that this type of workpiece can be milled under these conditions at 125 cu in. per min by the use of a 100 hp machine.

Obviously then, the limiting factor in this project is the amount of power in this spindle; and that is 30. The rate is established by these conditions as 37.5 cu in. per min.

The next step in the ipm determination: Width of cut is limited to 5 in. (the overall width of the workpiece is 30 in., but 5-in. wide cuts are taken with an 8-in diam cutter) and the depth is set at 0.200 in.; hence the cross-section area of cut is 1 sq in. Since the removal rate is 37.5 cu in., the ipm is 37.5.

Checking on the tooth load at this feed rate, the following results are obtained: $37.5 \div 8 \div 300 = 0.015$ in. approx. (Note that the sfpm selected is 600 and hence the rpm is approximately 300 and the 8-in. cutter has eight blades.)

Neither the tolerances nor surface condition specifications for this job are such that they need be taken into account when rating this operation. Subsequent machining makes this unnecessary. Hence this job is rated at 37.5 cu in. per min, but solely because the limiting factor is the horsepower available in the spindle.

It is interesting to consider the effects on this operation with 50 and 100 hp spindles available. If the former, then the metal removal rate is 62.5; if the latter, then it is jumped, obviously, to 125. The 50 hp

Previous articles in this series covering carbide milling were as follows:

Part No.	*Subject*	*Issue Date*
1.	Fundamentals of carbide milling.	Feb. 13, 1947
2.	Low carbon steel and wrought iron.	Feb. 20, 1947
3.	Straight carbon and cast steel.	Feb. 27, 1947
4.	Heat-treated steels.	Mar. 6, 1947
5.	Armor plate, heat-treated alloy steel, stress proof steel, die plates.	Mar. 13, 1947
6.	Stainless steels.	Mar. 20, 1947
7.	Semisteel, Ni-Resist, alloy cast iron.	Mar. 27, 1947
8.	Factors governing cutter life, selecting feed rates.	Apr. 10, 1947
9.	Regulating life between grinds, cutter design.	Apr. 17, 1947
10.	Factors involved in good practice.	Apr. 24, 1947
11.	Tool grinding, reconditioning and blade setting.	May 8, 1947
12.	Converting to carbide milling.	May 15, 1947
13.	Planning carbide milling operations.	May 22, 1947
14.	Analyzing the workpiece, establishing feed rates.	June 5, 1947

spindle is practical, feasible, and economical. It is within decent design limitations and can be justified on the basis of overall machine tool and metal removal economies. Fifty horsepower spindle machines are now available and have been sufficiently long in use to have proved their reliability, worth and application. But except for very special purposes a 100 hp spindle probably will never be built. It is estimated that the head of such a machine would weigh approximately 7 to 8 tons, and other obvious limitations in both machine tool design and engineering materials militate against spindles larger than 50 hp in spite of the fact that 100 hp can be poured through a milling cutter, or rather its carbide tips, without evident damage or even uneconomical life limitation.

If 50 hp had been available for the operation on this machine tool base component, then the tooth load would have been 0.026 in. with an ipm of 62.5. This is still within the range of practicality and good carbide operation. A tooth load of 0.026 in. would probably have increased the cutter life. As it is, 2100 cu in. were removed between grinds; it is not at all unlikely that this could have been increased to 2500 or 3000 with a chip load of 0.026 in.

But note what happens of 100 hp were available. Then the removal rate increases to 125, the tooth load to 0.052 in. and the ipm to 125. These are fantastic rates both for the machine and the cutting material; not only fantastic but impossible. The first step to bring this job in line with 100 hp is, obviously, to increase the width of the cut. A 5-in. wide swath using an 8-in. diam cutter is according to the rules and should not be increased, particularly if the cut is to a shoulder as in this case. Hence a 10 in. cutter could now be recommended, and by deserting the better half of conservatism the width of the swath increased to 8 in. The cross-section area is increased to 1.6 sq in., and hence at a removal rate of 125 the ipm is reduced to 80 and the tooth load is 0.026 in. These characteristics are within the pale of possibility but that is all.

The increased rate of metal removal is hardly justified on the machine tool base component since the handling time cannot well be reduced below an obvious minimum set by the inherent nature of the workpiece and its dimensional specifications. Hence while the cutting time is halved, the overall time is reduced probably not more than 15 to 20 pct. It is doubtful, therefore, whether the increased cost of a 100 hp head, and it will be disproportionately great, will justify a reduction of floor-to-floor time of 15 to 20 pct, particularly if such pieces are appearing in job lots of no greater size than 15 to 25 at a scheduling.

Part 16 of this series on carbide milling will appear in the next issue.—Ed.

. . . NEW BOOKS . . .

"German Research in World War II," by Leslie E. Simon. Drawing on first-hand observation and information obtained from examining German scientific establishments immediately following their capture, the author has recorded German weapons research and has explained the extent to which the Germans succeeded or failed in their projects, and why they did so. Descriptions of experiments with jet-propulsion, rockets, sound as a weapon, tanks and aircraft armament are included. John Wiley & Sons, Inc., 440 4th Ave., New York 16. $4.00.

* * *

"Stainless and Heat-Resisting Steels," by Edwin Gregory and Eric N. Simons. A work on the wide range of stainless and heat-resisting steels which begins with a metallurgical classification of various types of steels and proceeds to a discussion of methods of working and heat-treatment, as well as of properties and applications of each type of steel. The book has been written for the non-technical reader as well as metallurgists. Hutchinsons Scientific & Technical Publications, 47 Princes Gate, London, S.W. 7. 8s 6d net.

* * *

"Index to Literature on Spectrochemical Analysis." Two indexes to literature on spectrochemical analysis cover the period from 1920 to 1939 and from 1940 to 1945 respectively. The first has approximately 1500 references on subjects such as light sources, quantitative analysis, etc. The second lists almost 1000 contributions to literature in this field with brief abstracts of the material. American Society for Testing Materials, 1916 Race St., Philadelphia 3. Part 1, $1.50, 100 p. Part 2, $3.00, 200 p. Both for $3.75.

* * *

"International Contracts and the Anti-Trust Laws," by Harry Aubrey Toulmin, Jr. This book has been written to show business men how to negotiate and draft sound international contracts and avoid anti-trust violations, in the new era of international cooperation and control which the U .S. is now entering. Some of the topics treated are cartels and counter cartels; reciprocal trade agreements; import trade practice; cross licensing; foreign anti-trust laws; patent pooling agreements; and the anti-dumping laws. W. H. Anderson Co., 524 Main St., Cincinnati 2. 1068 p. $15.00.

* * *

"Practical Emulsions," 1947 Edition, by H. Bennett. Emulsions such as those used as polishes and soluable oils for metal cutting have been included with others in this publication on how to make and evaluate emulsions for industrial use or resale. A symposium on industrial emulsions includes their use in leather treatment, dying and coloring, synthetic latex, polishes, paints, etc. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2. 568 p. $8.50.

* * *

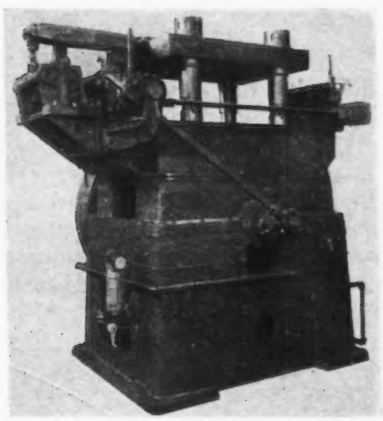
"Tungsten," by K. C. Li and C. Y. Wang (second edition). The present edition covering the history, mining, metallurgy and industrial application of tungsten has been revised by the addition of more recent material to all the chapters, particularly those on the geology and industrial application. An appendix contains information on the postwar tungsten situation. Reinhold Publishing Corp., 330 W. 42nd St., New York 18. 430 p. $8.50.

New Equipment . . .

Recent developments in automatic presses for die work, double cylinder broaching machines, squaring shears, a wire cutoff machine, induction heating units, and induction and synchronous motors are described in this week's review. A powder-cutting blow torch, automatic hopper feeding units, face mills and a silver brazing paste are also discussed.

Automatic Presses

DESIGNED for progressive die work, a line of automatic presses available in sizes from 30 to 750-ton capacities has been announced by the *Brandes Press Co.*, 6408 Euclid Ave., Cleveland 3. The machines feature rugged construction, large bed areas, and operation at the highest possible speed for blanking, forming and drawing operations. The crankshaft is located below the bed, working through a lower cross head and guided draw rods pulling the top platen down on the material evenly at four points, it is said. The press is



equipped with friction disk clutch and brake. The model illustrated is of 175-ton capacity, equipped with double roll feed and scrap cutter. Back geared machines are also available in all sizes for deep drawing work.

Diecasting Machine

FOR diecasting zinc, tin, and lead *Wickes Bros.*, Saginaw, Mich. has produced the No. 4 diecasting machine which will produce castings automatically simply by pushing an electrical start button. Provision has also been made for manual operation of any single function of the diecasting cycle. High production of the machine is gained, it is said, by the rapid closing and opening of the dies at 750 ipm with a momentary slowdown just before the dies close. Distance between the platen and bolster plates is adjustable from

9 to 23 in. The opening of the dies can be adjusted to 6 to 16 in. Die locking pressure is estimated at 500 tons. Dual melting pots, the preheat and the injection pots, are installed in the machine. Injection capacity is rated at 100 cu in. and injection pressures are possible for 1500 to 6000 psi.

Valve Grinder

FOR grinding automotive and airplane valves to an exact seating surface the *Landis Tool Co.*, Waynesboro, Pa., has developed a new type H valve grinder which handles valves with face angles

from 0 to 62½° and face diameters of from 7/16 to 3½ in. The Microsphere bearing headstock uses collets or V blocks for chucking and clamps hydraulically. Loading and unloading may be done with the headstock spindle rotating or it may be cycled to stop when grinding is completed. The headstock is mounted on a fixed table which provides support for the full swiveling range. The wheel spindle, also mounted on Microsphere bearings has a reciprocating movement adjustable from 0 to ⅝ in. Standard wheel size is 20 x 1 x 8 in. with a 3 hp wheel drive motor. The hydraulic oil reservoir contains 32 gal and the coolant reservoir, 42 gal. Machine weight is 8700 lb.

Broaching Machine

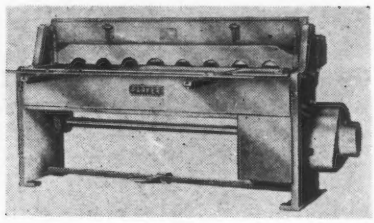
TWO jobs can be set up at one time and worked at either end on a new double-cylinder 36-in. stroke hydraulic broaching machine, according to the manufac-

turer, *Zagar Tool, Inc.*, 23880 Lakeland Blvd., Cleveland 17. An oil control valve arrangement is said to make possible extremely slow ram speeds without loss of pulling power, which equals 16,000 lb, and the return stroke is constantly fast. Double cylinders spread pulling stress and assure smoother operation. Another feature is the grouping of controls on a recessed instrument panel to assure hairline selection of speeds. These machines are equipped with 220/440 v, 3 phase, 60 cycle motors wired to suit available current.

Squaring Shears

A NEW 10-gage power squaring shear having oil-hardened tool steel, four-edged blades is now in production at the Santa Monica, Calif., plant of the *Parker Mfg.*

Co. Drawn or folded parts may be cut to within 1½ in. of their shoulder, it is said, allowing a close trim on basins, sinks, cowlings and similar objects. Design of the shearing unit is box type with a low center of gravity to minimize



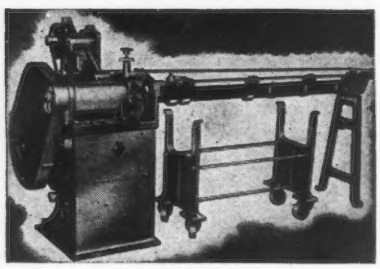
vibration. The shear stands 47 in. high, weighs 4250 lb and is equipped with a 5 hp motor. Capacity of the machine is 85 strokes per min, with cutting length, 73 in. and blade length, 75 in. Back gage range is 18 in.; front gage range is 38 in. Floor space requirement is 32 x 104 in.

Power Presses

SAID to be an advanced type, hydraulic power presses built in 8 and 20-ton capacities have been announced by *Aristo Power Tools, Inc.*, 601 W. Washington Blvd., Chicago 6. In this AristoCraft power press the power unit can be removed and used separately as a portable jack for a variety of lifting, pulling, pushing, and clamping operations. The 8-ton capacity press incorporates an 8-ton Blackhawk jack, specially designed for inverted operation in the press. The presses have arcwelded frames.

Wire Cutoff Machine

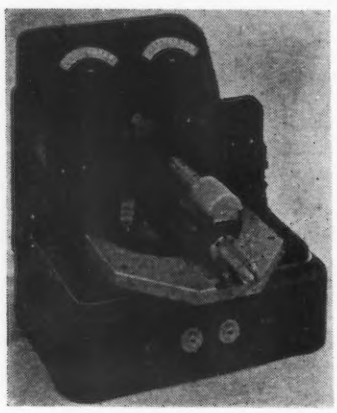
CALLED the Wiro-Matic machine, a wire straightening and cutoff machine has been offered



by the *Dore Mfg. Co., Inc.*, Grayling, Mich. Featuring flexibility of operation, the machine can accommodate a capacity range of 0.040 to 0.156-in. diam wire, and with a simple adjustment is said to do a variety of jobs. A production rate of 10,000 pieces per hr of 9-in. lengths of 0.040-in. diam basic bright wire is claimed for the machine.

Contour Gage

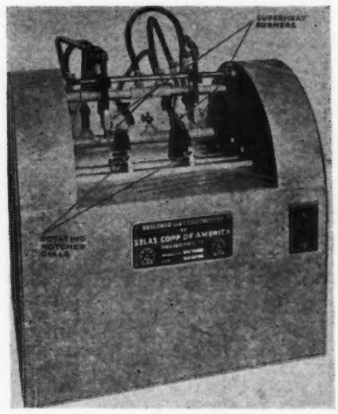
TO afford a fast and accurate means of checking the cam contour of automotive pistons, *Pratt & Whitney*, Div. Niles-Bement-Pond Co., West Hartford, Conn., has developed an Electrolimit contour gage. This gage is a two-section gaging fixture designed for checking the cam contour of centerless cam ground pistons. It consists of a floating pressure shoe arbor mounted on a slide, so that the arbor may be pulled out to install the piston for gaging and re-



move the piston after it is measured. The arbor assembly rotates through an arc of 180°. Two Electrolimit heads are used to indicate the cam contour, each head having a floating gaging point and a fixed pickup point. When the piston is mounted in position for gaging, the fixed pickup points contact the bottom piston ring land; the floating gaging points rest on the bottom of the cylinder skirt. As the piston is rotated through 90° either side of the center position, the meters indicate the variation in cam contour between the ring land and the skirt.

Heat Treating Machine

FOR heat treating fragile assemblies weighing as little as a few ounces, the *Selas Corp. of America*, Philadelphia 34, has designed an automatic gas-fired heat treating unit having close heat control required for such operations. The machine illustrated heat treats magnetic pull wires used in business machines. Assemblies are placed on a rotating drum and eye-



lets are heated to hardening temperature by a set of staggered high-heat burners and quenched by a water spray. A second set of burners anneals the weld and applies cooling water to the hardened eyelets so that they will not be annealed. Production rate is said to be about 1200 pieces per hr for this application.

Induction Heating Unit

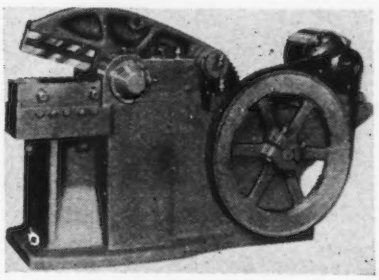
ADDED to the line of induction heating machines manufactured by the Tocco Div., *Ohio Crankshaft Co.*, 3800 Harvard Ave., Cleveland, is a 750 w 450,000 cycle Toccotron, a bench type machine designed primarily for silver brazing

and soldering, but also adaptable to hardening, annealing and forging applications within its power capacity. The unit is of the tube oscillator type. It operates from a 110/120 v ac single phase 60 cycle current source and is tapped to accommodate either single or multiple-turn inductor coils. The new unit

requires no water connections, is suitable for both automatic or manual operation, and is designed to operate continually at full load for mass production work yet is adaptable to quick setup changes required by job-shop or toolroom operations.

Scrap Metal Shear

FOR cutting light scrap metal the No. 00 alligator shear has been developed by the Canton Div., *Hill Acme Co.*, 6400 Breakwater Ave., Cleveland 2. The shear has a capacity of 1½-in. rounds or squares in mild steel and ⅜ x 12-in. plates; knives are 12 in. long. The adjust-



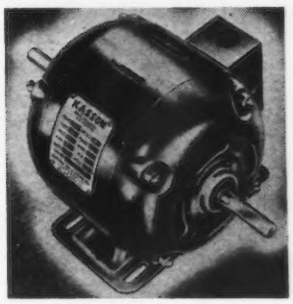
able knife seat requires no shimming after knives have been reground and the king pin, crankshaft are bronze bushed.

Rayon Conveyor Belt

CALLED the Ray-Man tension-master belt, a conveyor belt with rayon cord plies as a strength member has been designed by *Raybestos-Manhattan, Inc.*, Passaic, N. J., to meet the needs of mechanized coal and metal mines, quarries and limestone plants for a belt of high tensile strength for increasing heavy-duty long-lift conditions. The belt retains the preferred method of the conventional vulcanized field splice, as well as flexibility and easy troughing. Other advantages claimed for the belt are that it can utilize conventional type idlers and pulleys and permits construction modifications to suit varying service conditions.

Fractional HP Motor

FEATURING an all-steel-housing, a 1/3 hp split phase induction motor, known as the Kasson Rotomotor, has been marketed by *General Die & Stamping Co.*, 262 Mott St., New York 12. This motor has baffles and louvers in the housing to assure cooler running. The life of the motor is said to be increased considerably as the starting winding is made from glass insulated wire and the starting mechanism has been gun-metal



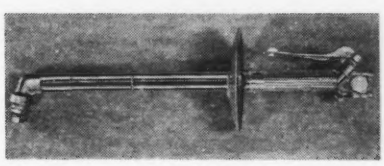
oxidized before assembly to minimize rust in service. Sealed-for-life ball bearings are standard equipment.

Inert-Gas-Filled Motors

FEATURING simple, smooth design, two special 300-hp, 240-rpm inert-gas-filled synchronous motors for use in an inflammable atmosphere have been announced by the *General Electric Co.*, Schenectady 5. The enclosure has built-in coolers and a sealed chamber filled with a noncombustible gas. The gas is said to be under sufficient pressure so that any leakage will be outward and no air or inflammable gas will get into the motor. There are no bumpy terminal boxes to mar the smooth external lines of the motors. The inert gas follows unrestricted flow lines in the cooler, which is located over the motor, to give efficient heat transfer.

Powder-Cutting Blowpipe

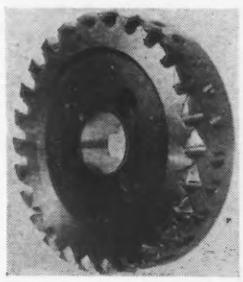
A HAND - OPERATED cutting blowpipe, for use with the powder-cutting process, has been developed by the *Linde Air Products Co.*, 30 East 42nd St., New York 17. With this blowpipe, oxidation-resistant materials, such as



stainless steels, can be cut with ease, it is said. With the proper nozzle, this blowpipe, known as the Oxweld Ac-4, will cut stainless steels, chrome alloys, and cast iron up to 9 in. in thickness. In addition to the usual oxygen and acetylene hoses, a third hose conducts the powder from a powder dispenser by means of compressed air. When this iron-rich powder is burned in the oxygen stream, it increases the temperature and oxidizing effect of the oxygen-cutting action. A powder-cutting attachment for the standard Oxweld C-39 machine-cutting blowpipe has also been developed by the company, which, with appropriate sizes of nozzles will cut all of the common types of stainless steels ranging from ¼ to 3 in. in thickness at speeds of 20 to 7 ipm.

Face Mills

FOR milling frail malleable or alloyed castings, the Super Tri-Bit face mill manufactured by *Weddell Tools, Inc.*, 37 Centennial St., Rochester 11, N. Y., features



closely spaced triangular-shaped cutter blades said to have the same strength as rectangular blades weighing 50 pct more. Milling feed rates are said to be high. For maximum efficiency, cutting blades are set into the body to suit operating conditions. Roughing cutters which have wide chamfers have the blades adjusting in a radial direction and in the finishing cutters, blades adjust generally in an axial direction. Blades, which are furnished in any cutting material, are locked into a V by a single lock screw and are backed up by an adjusting screw to permit minute blade adjustment. They are set at the most effective cutting angles considering the material machined and to direct chip flow away from the work. Roughing cutters are generally the ⅞-in. heavy duty type while the medium duty ⅝-in. bit serves for finishing operations.

Ball Bearing Centers

ANNOUNCEMENT of the development of RED-E standard ball bearing centers for use with high speed steel cutting tools has been made by the *Ready Tool Co.*, 555 Iranistan Ave., Bridgeport 5,

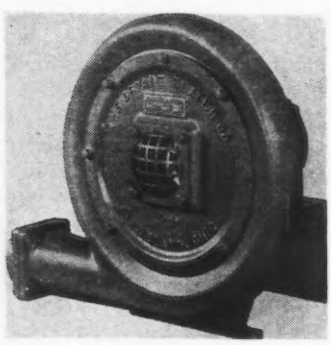
Conn. The new centers are available in both shank, ball and roller bearing types. Double-row angular contact preloaded precision ball bearings provide thrust capacity 1½ times the radial capacity. The centers are constructed of alloy steel with a heat treated spindle. Accuracy is held within 0.0002 in., it is said, and labyrinth enclosure prevents entry of cutting oil or chips and escape of lubricant.

Silver Brazing Paste

DEVELOPED specifically for brazing carbide tips, Nu-Braze silver alloy diffusion paste No. 50 has been announced by *Sherman & Co.*, 197 Canal St., New York 13. It consists of a new silver brazing alloy finely pulverized and then ground with just the right proportion of special flux, which begins to melt at 480°F and protects both the carbide tip and the steel joint area with a liquid protective film before the heat-generated oxides can form. The viscosity of the flux is so low that the molten brazing alloy component gently eases all of it out of the joint. The paste is painted on the joint surfaces of the carbide tip with a small brush: the tip is held in position and heated.

Lightweight Blowers

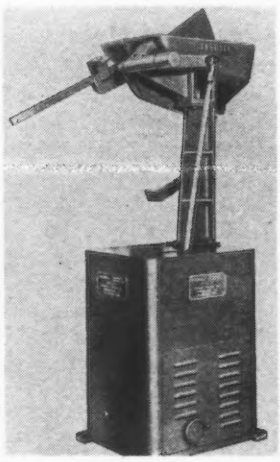
A LINE of lightweight Hi-Flo blowers, designed for constant pressure output over a broad capacity range, has been announced by the *Bryant Heater Co.*, 1020



London Rd., Cleveland 10. These direct-connected centrifugal machines are constructed of aluminum housings, bases and side plates, with a lightweight steel impeller for smooth, quiet operation and low bearing load. They are designed for ease of application and mounting in conjunction with other units. Any one of seven outlet positions may be chosen. The hub arrangement in the blowers permits the use of standard 3450 rpm motors with regular shaft extension. The blowers available in this series range from 2 to 6 in. in outlet pipe size, supplying 100 to 525 cfm in the 4 oz pressure classification, and in 2 to 3 in. outlet sizes furnishing 125 cfm at 18 oz, and 275 cfm at 16 oz, respectively. Powering motors range from 1/3 to 2 hp.

Automatic Hopper Feeds

AN automatic hopper feed which is a fully automatic selfcontained feeding unit has been de-



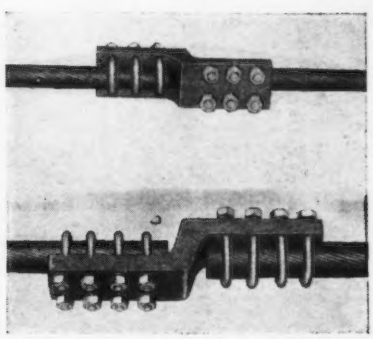
signed by the *Feedall Machine & Engineering Co.*, 70 Vine St., Willoughby, Ohio. This compact self-driving unit can be attached to a variety of high production machines. It is said to be capable of feeding cylindrical work to 1¼ in. diam to 6 in. in length, and shoulder work to 1⅛ in. diam to 6 in. length. Power is supplied by a ½ hp motor coupled to a variable V-belt drive which is adjusted while the machine is running, thereby assuring a smooth flow of work to the machine. Besides feeding various grinding and screw machines, etc., it can be used in feeding work through induction heating machines, it is reported.

Versatile Organic Mixture

ANNOUNCEMENT of an organic mixture derived from petroleum and called Alox 427 has been made by *Alox Corp.*, 3933 Buffalo Ave., Niagara Falls, N. Y. Its physical and chemical properties are said to offer possibility of applications such as emulsifying and corrosion preventive agents and as a binder for particles, such as sand, coal, coke, etc. When blended with sand in the ratio of one part of Alox 427 to 40 parts core sand and baked for 2 hr at 400°F a strongly bonded sand core is produced which can be used in the construction of castings. There is said to be no gas produced by Alox 427 when used as a core oil at the temperature of molten castable metals, and the core is easily removed from the cooled finished casting. As little as 0.25 pct in water protects steel against corrosion when immersed in the solution. A solution of amine soaps of Alox 427 in water provides a medium for the storage of small machine metal parts for periods of several months or longer. When the metal is removed from the solution, a thin, almost invisible film is still present on the surfaces, which will protect it for a day or two from atmospheric corrosion. A complete emulsifiable base consisting of soda soaps of Alox 427, stabilizing agent, and oil, is available for metal cutting fluids and coolants. This product is known as Alox 438.

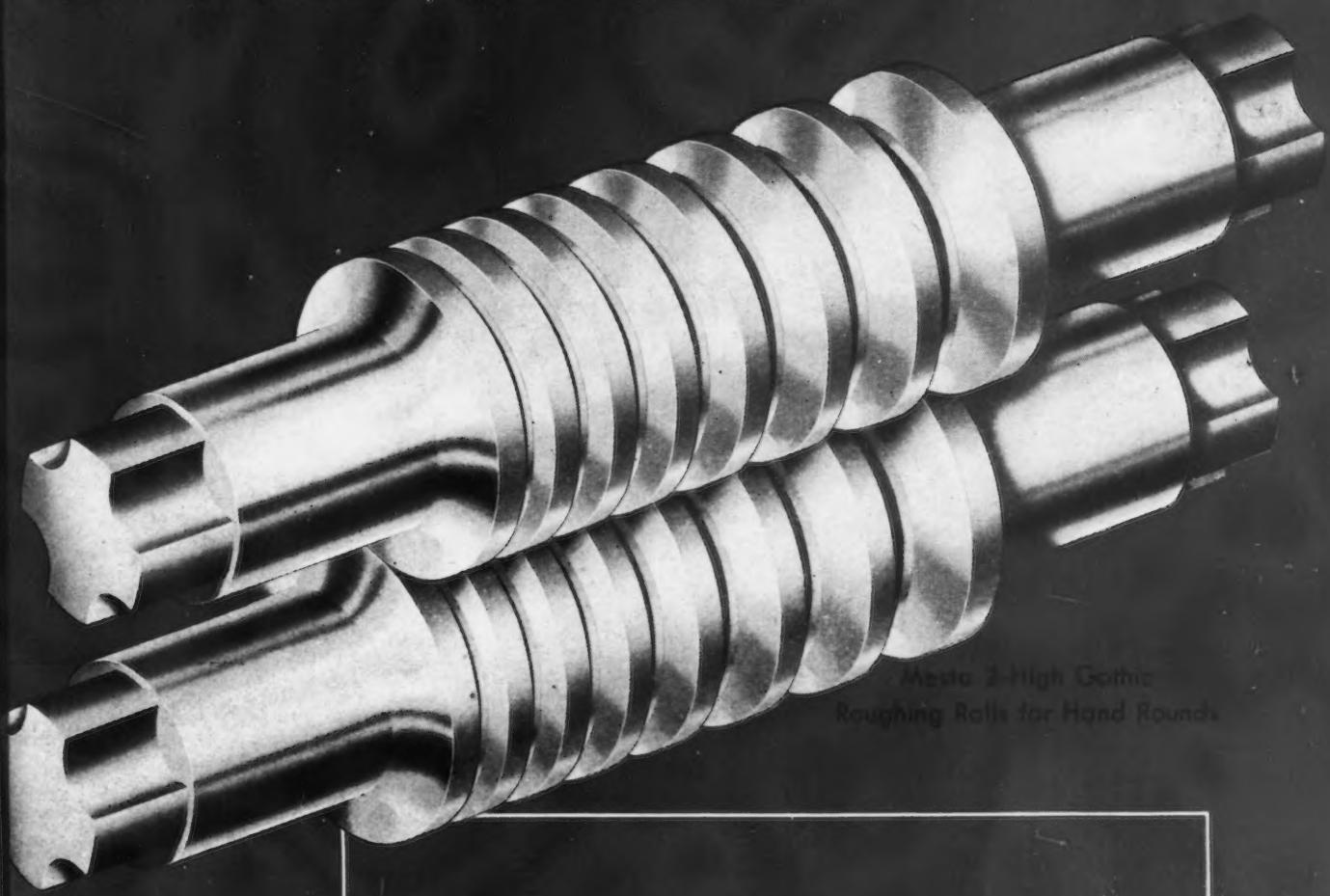
Feeder Splicer

DESIGNATED the Type S, a feeder splicer marketed by *Mosebach Electric & Supply Co.*, 1115 Arlington Ave., Pittsburgh 3, has been developed for splicing electrical cables of various sizes,



quickly and securely. Ends of the cables are inserted in the splicer and are held in place with galvanized steel U bolts. The body is cast bronze providing good electrical conductivity. Splicers are furnished in three sizes to handle from 211,600 to 1,500,000 cm cables.

MESTA ROLLS



Mesta 2-High Gothic Roughing Rolls for Hand Rounds

UNEQUALLED plant facilities, equipped with the most modern precision machinery, and manned by skilled workmen with long service records, an engineering staff whose technical ability has been accumulated over many years—these resources are responsible for Mesta's leadership in the design and production of all types, grades and sizes, including the largest rolls used in the industry today.

Mesta produces cast iron, cast steel and forged steel rolls for all types of ferrous and non-ferrous rolling mills.

Send for your copy of this 64 page booklet containing valuable engineering data. It will cost you nothing to obtain.

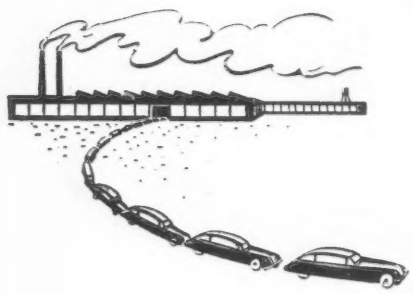
DESIGNERS AND BUILDERS OF COMPLETE STEEL PLANTS

MESTA MACHINE COMPANY · PITTSBURGH, PA.

Assembly Line . . .

WALTER G. PATTON

• GM's new high compression engine is operating successfully on 100 octane fuel at 12.5 compression ratio . . . Boss Ket's "resignation" not taken too seriously.



FRENCH LICK, IND.—Judging from the enthusiastic response of automotive engineers assembled here for the SAE annual summer meeting, Mr. Kettering's final contribution as vice-president and director of the GM laboratories may turn out to be of even greater value to the motoring public than his self starter, tetra-ethyl lead or fast-drying finishes for cars.

The long run prospect for this new "dieselized" high compression gasoline engine is that it may save the motorist one-third of his annual fuel bill. For the country as a whole the saving is estimated at a billion dollars a year. Of course, this feature has universal appeal to motorists and engineers alike.

As the automobile engineer sees it, the new engine has definitely laid the ghosts that a high compression engine is necessarily rough, that it will necessarily require high cost fuel, that such an engine will be expensive to build and that it will be much heavier than a comparable standard engine.

During the past week more than 400 automotive engineers have had an opportunity to ride in one of three Oldsmobile sixes powered by one of the new GM high compression engines. No changes on the standard car were necessary to fit the new engine into a standard Oldsmobile chassis. Passengers and drivers alike have been unable to distinguish between the performance of the new engine and the standard power plant, although many have observed the extra power available in the new engine at speeds beyond 60 mph.

Cross-country tests made since last November indicate an average gain in fuel economy of about 33 pct for the new high compression engine. Where speed is held below 50 mph the fuel saving was 35 pct and up to 70 mph the gain was 33 pct. About two-thirds of all driving is done in the city and the fuel economy demonstrated by the new engine in city driving is over 40 pct.

The table, right, gives a comparison of the new high compression and the standard L-head production engine. Displacement of 181 cu in. for the H. C. engine may be compared with 238 for the L-head model. Compression ratio is 12.5 compared with 6.4 for the 1946 model. Peak pressure at 2000 rpm is 1150 for the H. C. engine compared with only 525 for the present Olds 6. Maximum BHP is 95 compared with 85. One of the most striking comparisons shows that heat rejection to cooling water expressed in Btu/Bhp min is 31.5 compared with 45.5 for the standard production engine.

Triptane, the new fuel which contributed so much to the new engine, cannot be used in a diesel engine which is noted for its ability to burn a wide range of fuels.

IN presenting his paper entitled "More Efficient Utilization of Fuels" to the SAE, Mr. Kettering was giving a new paper on the same subject he discussed 30 years earlier before the same Society.

Reviewing briefly the history of fuels and their relation to engines, Mr. Kettering showed that during the past 30 years compression ratios have advanced from 4 to 4½ to 1 to the present 6½ to 7 to 1. Meanwhile, fuel octane numbers have advanced from 50 to 80 for automobiles and as high as 100 for aviation fuels. "The relationship of the fuel to the engines is the most fundamental problem in all internal combustion engines," he said.

Comparison of High Compression and Production Engine

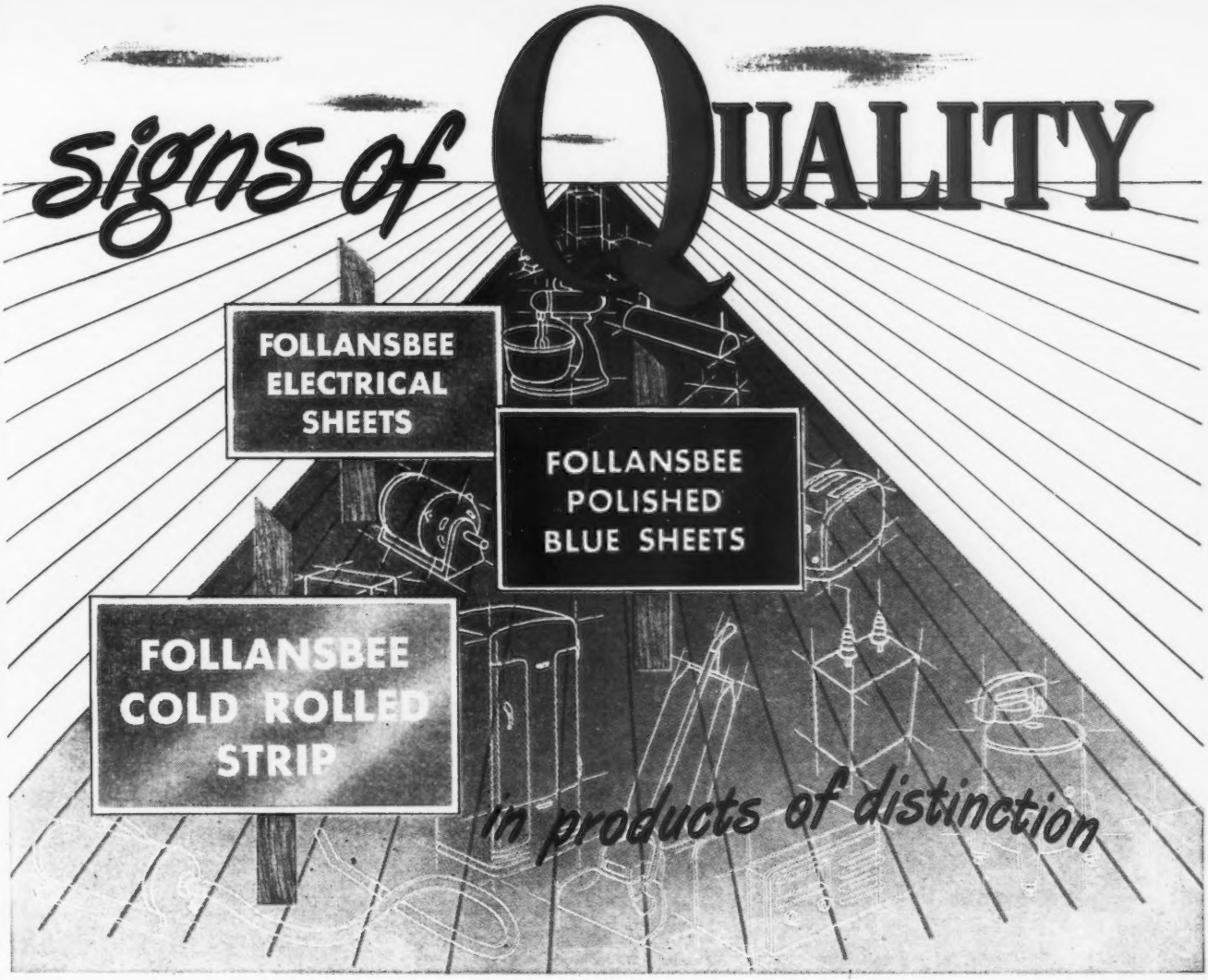
	12.5 CR	1946 ENGINE
Number of cylinders	6	6
Valve arrangement	Overhead	L-head
Bore and stroke	3⅜ x 3⅜	3½ x 4⅛
Displacement—cu in.	181	238
Compression ratio	12.5	6.4
Compression pressure at 2000 rpm	420 psi	165 psi
Peak pressure at 2000 rpm	1150 psi	525 psi
Engine torque at 2000 rpm	154	163
Mechanical efficiency at 2000 rpm	85 pct	81.5 pct
Maximum bhp	95 at 3600 rpm	85 at 3400 rpm
Minimum brake SP. Fuel	0.40 at 2000 rpm	0.54 at 2000 rpm
Miles per gallon at 49 mph	26.5	18.5
Heat rejection to water—Btu/bhp/min.	31.5	45.5
Rear axle ratio	3.63	3.63
Car test weight—lb.	4110	4110

Directly related to the new engine development is triptane, a high octane fuel developed by GM during the war. Triptane (2,2,3-trimethyl butane) is one of the best anti-knock fuels known and was first tested in an engine in 1926. In 1943 GM built a pilot plant at the GM Diesel Engine Div., Detroit, to make the new fuel. The pilot plant is said to have cost $800,000.

Since knock ratings do not go above 100, an arbitrary rating must be assigned to triptane. However, based on its performance number with tetra-ethyl lead added, GM believes its anti-knock rating may be as much as 500 under some operating conditions.

Triptane is particularly sensitive to lead additions, Mr. Kettering told his audience. The addition of 3 ml of lead per gal to ordinary gas raises its critical compression ratio about 0.5. The same addition to iso-octane raises its critical compression ratio 4 units and "runs triptane off the measuring scale."

Based on studies of a 30 cu in. single engine operating at 15 to 1 compression ratio, GM has designed and built its new 6 cyinder engine, which has a compression ratio of 12.5 to 1. The new H.C. engine delivers practically the same horsepower throughout the speed range as a standard Oldsmobile



Strongly linked with the successful products in any market are the quality components, essential in economical manufacturing and profitable marketing—components like Follansbee Specialty Steels.

In spite of the long continued shortages of Follansbee Specialty Steels there has never been a departure from the strict metallurgical and physical characteristics which have made the name Follansbee synonomous with *Quality*.

Designers can always specify Follansbee Specialty Steels with assurance of acceptance by the production engineer, the sales manager, and the ultimate consumer. As additional supplies become available you can incorporate the Follansbee *Signs of Quality* in more and more of your products of distinction.

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engine. For the most part, standard parts (Chevrolet, Buick and Olds) were used.

THE new engine weighs no more per horsepower than stock engines. The crankshaft is larger than standard and has 7 bearings compared with 4 bearings in the Chevrolet, for example.

The present distributor used is standard for a 12 cylinder car. Pistons are oil cooled, using essentially the same method employed in the GM diesel engine. A 6 v electrical system is used with some modification of the ignition coil winding and core. The valves, camshaft, piston rings, manifolding and exhaust systems are standard equipment.

Spark plugs have been "modified slightly." Cold starting has not been a problem and no excessive carbon deposits have been noted.

Up to the present time three H.C. engines have been built, each one with some modification over the other to take advantage of what Mr. Kettering calls "mechanical octane numbers." These are the factors that the engine designers build into an engine, Mr. Kettering explained, and are in addition to the octane characteristics present in the fuel.

Mechanical octane factors include compression ratio, spark timing, piston temperature, valve temperature, mixing temperature, mixing ratio, valve timing and combustion chamber shape. Adjustment of these factors has been important in eliminating roughness from the new H.C. engine.

The cost to build the new engine should not be more than 5 to 10 pct higher than the existing engine, Mr. Kettering said. Preliminary estimates which are partially confirmed by oil company research show that a satisfactory fuel for the new H.C. engine should cost only a few cents more than the present premium fuels.

Mr. Kettering predicts that a jump from 6.5 to 12.5 compression ratio in automobile engines will not be made over-night. The change will come gradually over a period of years, he says. There are at present 30 million vehicles on the highways, Mr. Kettering said, that do not require high octane fuel. Nor could the auto industry entirely retool in any year to take advantage of the 12.5 ratio. The oil industry too will require several years to produce high octane fuel.

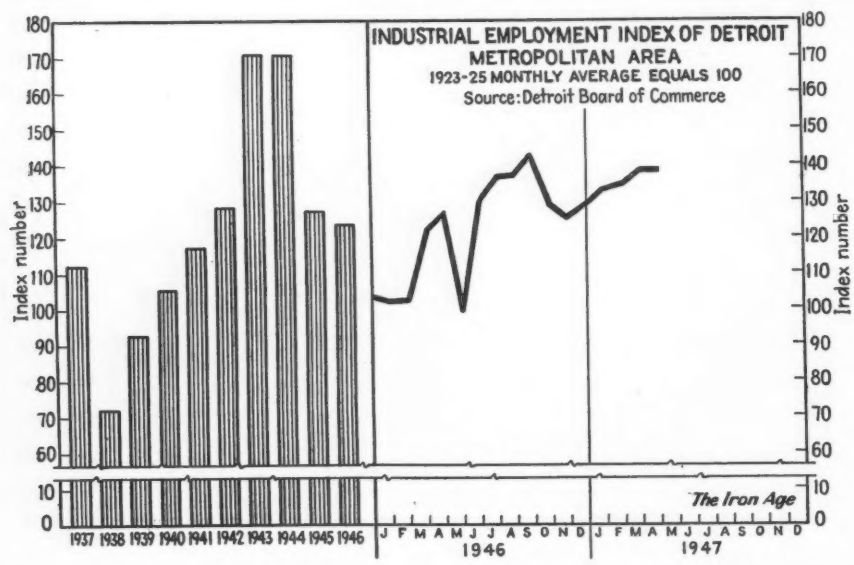
COMPRESSION ratio should go up, step by step, with fuels until the 12.5 ratio is reached, Mr. Kettering explained. He believes a "sensitive type of fuel" having a research octane number of approximately 100 will operate satisfactorily in the new engine.

While GM has declined to comment on some aspects of the new development, it is quite apparent that it will be advisable to use an overhead valve-type of engine where high compression ratios are employed. At present, only Chevrolet and Buick in the GM passenger car line use this type engine. Nash is the only independent automobile manufacturer using overhead valves at the present time.

Another possibility forseen by some engineers is the fact that the new high compression gasoline engine with its much higher efficiency may seriously challenge the diesel engine.

While Mr. Kettering is officially retiring as a GM executive, most of his friends here feel that his recent "resignation" should not be taken too seriously. He plans to take an office down the hall in the GM Research building. He will continue to work on the high compression and other research projects in the GM laboratory. In addition, he plans to devote more time to his researches on cancer and chlorophyl.

The auto industry and Detroit have not lost "Boss Ket." You'll be hearing from him again—perhaps even more frequently than you have in the past. At nearly 71 years of age he remains vigorous and as outstandingly enthusiastic as ever.


INDUSTRIAL EMPLOYMENT INDEX OF DETROIT
METROPOLITAN AREA
1923-25 MONTHLY AVERAGE EQUALS 100
Source: Detroit Board of Commerce
Index number
1937 1938 1939 1940 1941 1942 1943 1944 1945 1946
J F M A M J J A S O N D J F M A M J J A S O N D
1946
1947
The Iron Age

Stinson Sales Set Record

Wayne, Mich.

• • • **Record breaking deliveries** of 319 aircraft during May gave Stinson the biggest sales volume for any month in the company's 21-year history, William H. Klenke, Jr., General Sales Manager, announced.

The company's May sales exceeded the previous record high of 316 which was established only one month earlier. After the company's two biggest months in history, Stinson had delivered a total of 2027 of its 1947 models. In reporting the second consecutive record-breaking month for Stinson, Klenke said that its planes were purchased by a variety of people who fly them for business and pleasure.

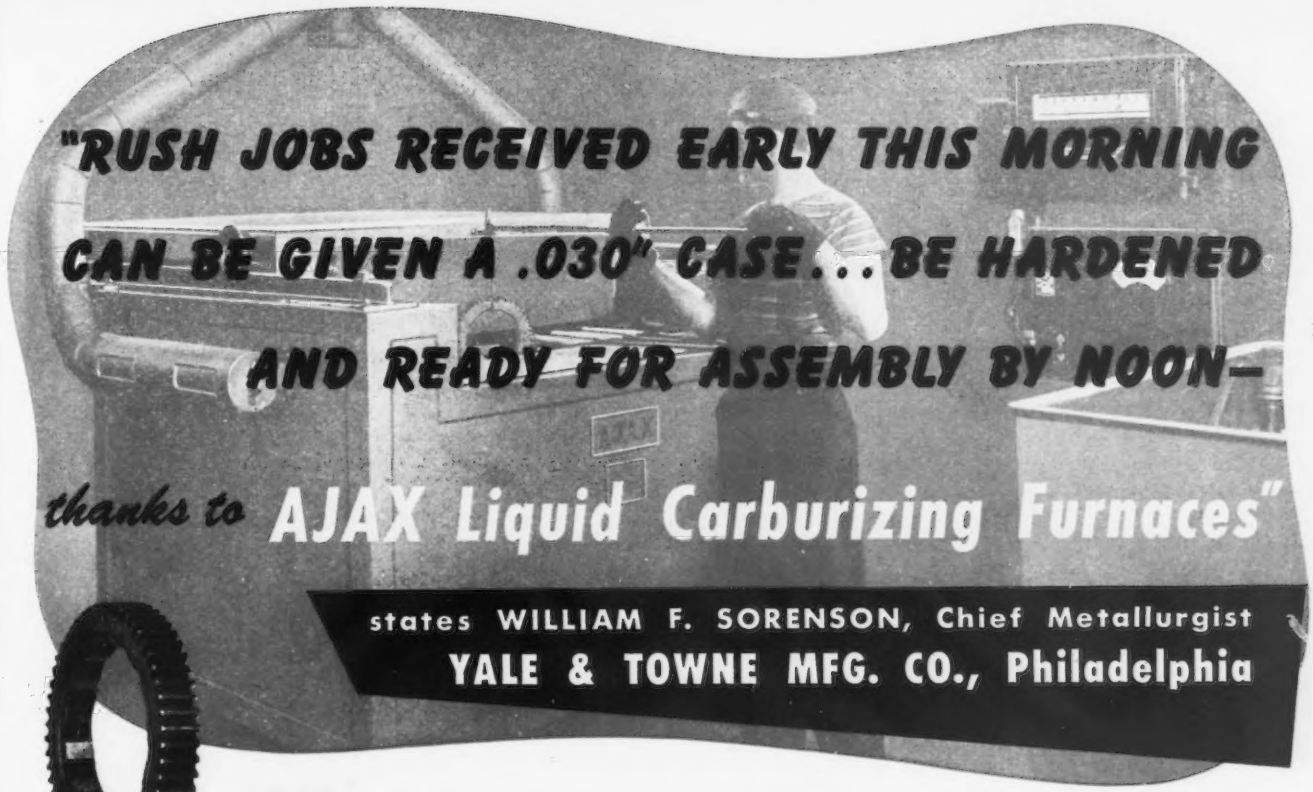
Eaton Buys $801,659 Plant

Washington

• • • **Sale to the Eaton Mfg. Co.** of the remainder of the war surplus plant it has been operating at Detroit, has been announced by WAA.

The sale, for $801,659 cash, includes land, buildings and installations which will enable the company to expand its payroll from 1000 to 1200 employees.

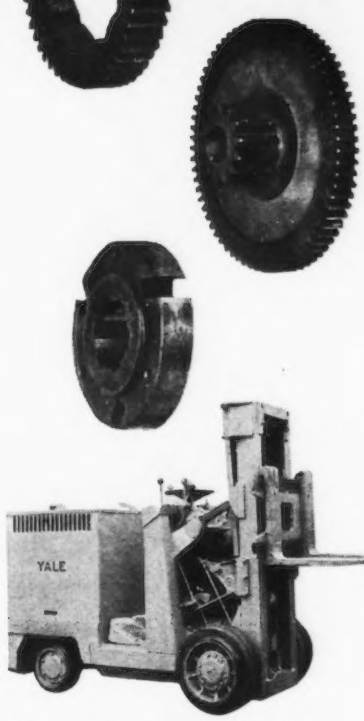
In May, 1946, the Eaton Company bought Building B of the plant for $100,308. The entire plant cost the government $1,448,774 when it was built for the production of aircraft engine parts.

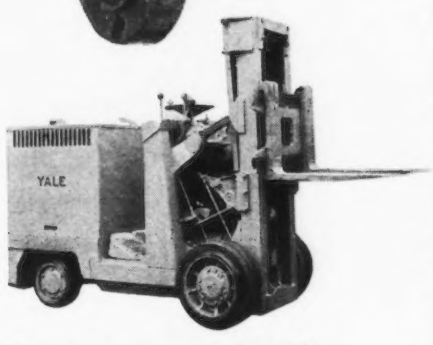


"RUSH JOBS RECEIVED EARLY THIS MORNING CAN BE GIVEN A .030" CASE... BE HARDENED AND READY FOR ASSEMBLY BY NOON—

thanks to AJAX Liquid Carburizing Furnaces"

states WILLIAM F. SORENSON, Chief Metallurgist
YALE & TOWNE MFG. CO., Philadelphia





One of many types of YALE Electric Power Fork Lift Trucks employing liquid carburized parts for longer wear.

"Hundreds of different types of gears and parts for Yale industrial electric trucks and hoists require *case hardening.* Often, a batch is needed in a hurry. *Gas* carburizing, cooling, sand-blasting and machining would take *well over 24 hours.* Even then, we would *reheat* the parts in our Ajax *salt bath* furnaces before oil-quenching, in order to preserve the finish and prevent decarburization and distortion. Altogether, at least a day-and-a-half would be consumed!

"But, thanks to our *Ajax liquid carburizing furnaces,* we obtain a .030" case of Rockwell C 60 or better on completely machined gears and parts *in only 3 hours* at 1650° F. We oil quench *directly* from the carburizing bath — eliminating reheating time and expense — and obtain clean, bright parts with negligible distortion.

"On all types of shaved gears we hold dimensions to .0008" or less . . . and get a remarkably *uniform* case. On high speed driving pinions and shafts, from 8 inches to 4 feet long, *selective liquid carburizing* of the two ends eliminates 80% of our straightening operations."

Reprints of technical articles on liquid carburizing, by Mr. Sorenson and others, will be sent on request. Complete information on AJAX Electric Salt Bath Furnaces and their many uses — neutral hardening, austempering, martempering, isothermal quenching, hardening, annealing, brazing, tempering, cleaning, etc. — is contained in the new 72-page Booklet #116. A copy will be sent any metallurgist or metalworking executive writing for it on his firm's letterhead.

AJAX ELECTRIC COMPANY, INC.
Frankford Ave. at Delaware Ave., Philadelphia 23, Pa.

The World's Largest Manufacturer of Electric Heat Treating Furnaces Exclusively!

Associate Companies: **Ajax Metal Co.** ● **Ajax Electric Furnace Corp.** ● **Ajax Engineering Corp.** ● **Ajax Electrothermic Corp.**

***In Canada:* Canadian General Electric Co., Ltd., Toronto, Ont.**

AJAX HULTGREN **ELECTRIC SALT BATH FURNACES**

Washington . . .

• White House Advisory Committee warns of second "Pearl Harbor" . . . Atomic attack possible in 5 years . . . Urges industrial preparedness, stockpiling, underground plants.

WASHINGTON — An Occidental version of the Oriental saying—"It is later than you think"—has been handed to the nation by the report of the White House Advisory Committee on Universal Training.

The report minced no words in stating with startling conciseness that in the considered opinion of the Committee, the United States could expect probable immunity from atomic attack for perhaps 4 years and, at the most, no more than 10. It lost none of its forcefulness by reason of the fact that two committee members are well known men in the religious field, who are opposed to war.

Although its primary purpose was to determine the advisability of universal military training, in recommending that the nation adopt such a program the group did not hesitate to draw an admittedly lurid picture of future dangers in supporting its recommendations.

It is estimated that America could not reasonably hope to retain exclusively the secret of the atom bomb beyond 1951. This led to the conclusion that having once discovered the process of bomb manufacture, an atomic attack in quantity would be possible from 1955 on.

With this background established, the commission recommended not only institution of peacetime military training to "back up our moral position" but that the United States immediately embark on a program looking to dispersal of strategic industrial plants and preparations to take industry underground. Also, it endorsed an intense research and development program for the purpose of finding new and potent weapons with which to arm a mobile striking force to repel attacks. Industry should stand ready for immediate mobilization, it added.

"The development of new weapons will be of no value," the commission reported, "unless our scientific progress is matched by industrial readiness for the problems of a war that may come without warning at supersonic speeds. . . . Because of the danger that production centers would be demolished in the first days of war, a start should be made now toward decentralizing the most vital plants and, in some cases, toward building underground or otherwise adequately protected facilities. Critical war materials must be stockpiled now and in the future."

ALTHOUGH the House Armed Services Committee has started hearings, there seems to be no chance of Congress itself taking up universal training at the present session although it has been hinted in some quarters that the President may ask the Congress to reconvene late this year in advance of the regular 1948 session to consider this and related matters.

In the meantime, the military services are quietly taking all action possible in the face of a limited budget. Army Engineers have been surveying existing underground facilities such as abandoned mines and natural caves for more than a year and pondering the merits of probable locations for others; particular attention has been given to the experience of enemy nations with such installations in the recent war.

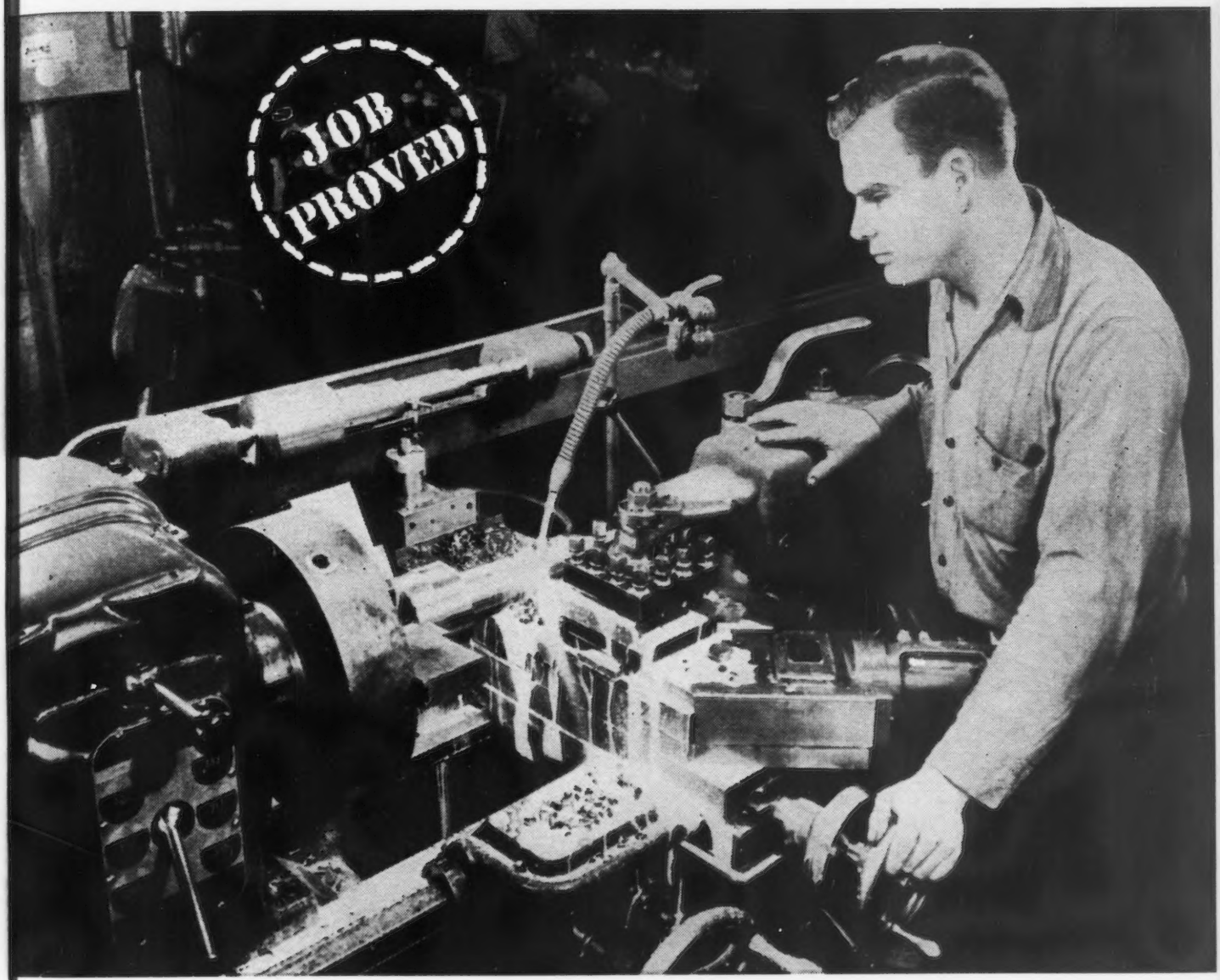
In anticipation of a possible training program, the Army has been withholding from WAA an estimated $5 billion worth of surplus supplies and equipment. It is regarded as significant, despite the apparent lack of attention by Congress to the White House request for a training program, that the House Appropriation Committee recommended that no reduction be made in either the more than 18,000 War Dept. employees now engaged in research and development or the 30,000 employed in arsenals and other military manufacturing and production activities.

Likewise, the Appropriation group recommended no reduction in the $222 million requested by the War Dept. for research and development and mildly rebuked the Budget Bureau for proposing to switch part of the research funds.

FOR more than a year, the Army-Navy Munitions Board has been engaged in instituting a program by which industry will advise and share in the responsibility of setting up a plan for industrial mobilization in the event of an emergency. A number of committees have already been formed and work will soon get under way in perfecting plans not only for mobilization but for intensive stockpiling of materials. Even before the President's committee had submitted its report, the House Appropriation Committee had recommended nearly $24 million to speed the industrial planning.

So far, stockpiling of strategic materials has been the greatest difficulty encountered in service preparations for emergency mobilization. Because of warborn shortages of goods, the production of which require scarce raw materials, little real progress has been made in this direction. Although the 79th Congress authorized stockpiling purchases at the rate of $360 million annually, end of the first year saw only about $75 million actually expended largely because of the impact bigger spending would have on the domestic economy. In the matter of standby war plants and machine tools, somewhat better progress has been made. The War Dept.

Turning S.A.E. 4145 Annealed . . . 315 S.F.P.M.



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hopes to have its program of earmarking 71,000 tools for storage completed by the end of July.

ALTHOUGH most establishments which have guaranteed employment and wage plans in effect are to be found in the industrial areas and 40 pct of them are found in the manufacturing industries, relatively few are in operation in the heavy or basic industries, it has been determined by the Bureau of Labor Statistics which furnished the basic data for the Latimer Guaranteed Wage Study.

According to the BLS, a total of 196 such plans, covering an estimated 61,000 workers, was known to be in active operation at the end of 1946. By far, the greatest proportion (55 pct) was in effect in plants or firms employing 50 workers or less; only 10 pct were to be found in employment units of 1000 workers or more.

The mortality rate of guaranteed wage plans has been high. More than 150 such programs have been placed into effect only to wither and die on the vine, including 96 in Wisconsin alone which were dropped in 1934-35 following amendment of the state unemployment compensation law. This also happened in other states where plans were instituted prior to enactment of compensation laws. Some, of course, were victims to special circumstances.

On the other hand, about a third of the total now in operation have been in operation for 10 years or more and 11 have worked successfully for a quarter century.

IN breaking down the BLS statistics, it is found that most of the plans now in effect express their guarantees in terms of employment rather than in wages. Thus, if a worker fails to make himself available for work, presumably he would not qualify for pay during the idle periods. This line of reasoning is easy to follow since about two thirds of the plans guarantee the employees 52 full weeks of employment or full pay for such idle periods as may occur.

Employees are represented by their unions in 130 of the working plans. In such cases, the plans are largely subject to the recurring collective bargaining contracts although in a number of instances the guaranteed wage plans had been inaugurated before unionization of the workers.

In more than half of the plans (101), coverage is open to all, or nearly all, employees—in some instances "all" being defined as applying to production workers only; for the most part, however, the provisions include office workers and supervisors as well. In only 36 instances is the coverage strictly limited to "regular" or "basic" employees.

IRRESPECTIVE of federal action, the subject of the closed shop is receiving increased attention from the individual states themselves. As of the first of April, according to Labor Dept. statistics, at least 14 states had enacted laws or amended their constitutions to place varied limitations on the operations of the closed shop. Such laws or proposed amendments were under consideration by about 14 other state legislatures.

States listed by the State Dept. as having placed legislative restrictions on such agreements were Arizona, Arkansas, Delaware, Georgia. Iowa, North Dakota, North Carolina, South Dakota, Tennessee, Texas, Nebraska, Virginia, Florida and Alabama.

For the most part these laws merely provide that employment must not be denied or abridged to any person because of either membership or nonmembership in a union or labor organization. For example, under the Colorado Peace Act the closed shop is prohibited unless it is wanted by two thirds or more of the employees of the recognized bargaining unit. Wishes are determined by a secret ballot under the supervision of a state commission. Kansas and Wisconsin laws follow the same general pattern.

On the other hand, in some states the legal restrictions go further and specifically outlaw all union shop contracts which would exclude from employment persons who may not be union members. Constitutional amendments in Arizona and Arkansas, for instance, make this provision.

On the basis of the latest statistics available to the Labor Dept., measures of these general types were pending in California, Colorado, Connecticut, Kansas, Massachusetts, Michigan, Missouri, Minnesota, Maine, Ohio, Oregon, Pennsylvania and South Carolina. In New Mexico such an amendment has been approved by the legislature and will be submitted to the voters at the next election.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

THEM SMART ALECKS ARE ALWAYS PAINTIN' A GUY'S SHOES WHEN THEY KETCH YOU ASLEEP -- BUT TH' OLD WATCHMAN HAS THAT OLD DOG -- HOW CAN--
OH, THEM GUYS ARE ARTISTS! THEY AIN'T FOOLIN' WID TH' WATCHMAN -- THEY'RE PAINTIN' TH' DOG'S FEET -- TH' BIG BOSS'LL BE NEXT!
J.R.WILLIAMS 6-13
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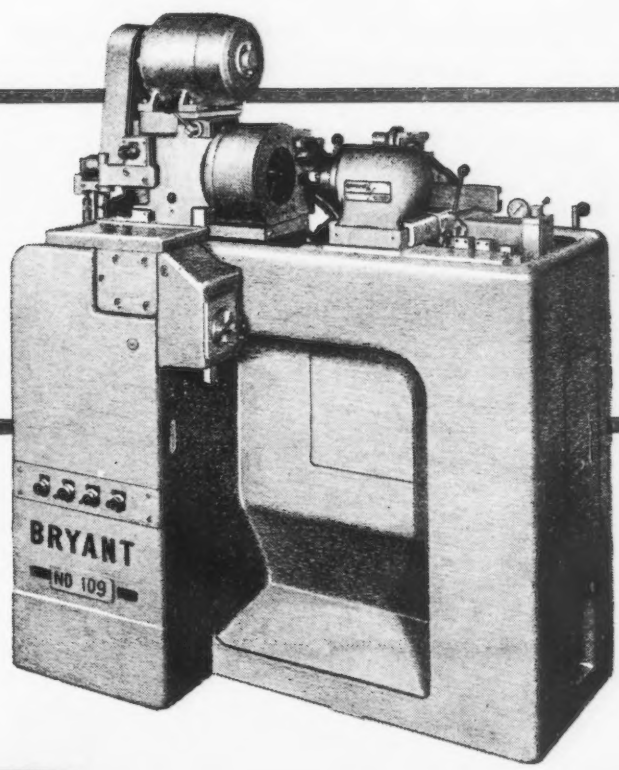

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West Coast . . .

ROBERT T. REINHARDT

• Washington steel foundry may go begging . . . "Most powerful" turbo-jet engine announced by Menasco . . . Geneva reduces coal to iron ratio by 37 pct.

SEATTLE—There is little local interest being evidenced in the offer of the WAA to sell the steel foundry built by the government and operated by Pacific Car & Foundry Co. adjacent to its plant at Renton, Wash.

Pacific Car & Foundry has been operating the plant since the war on a month to month lease basis for the production of castings going into their railroad cars and other heavy products. This facility is one of eleven foundries in the United States which is equipped to produce armor plate and is considered to be an efficient unit.

Under present management the foundry has been operating one shift a day producing 19 ft long crankshafts for diesel engine manufacturers in the East.

It is understood that the present operators are entering a bid for the foundry and little competition is expected because it is generally believed operation of the foundry without the business of the present operators would probably not be profitable. Bids close on this property July 1.

If the reaction to the recently offered steel foundry at Pittsburg, Calif., for which no bids were received is a criterion, competition for the Renton plant should not be too keen.

Pacific Car & Foundry is operating at a high rate of capacity producing a line of refrigerator railroad cars for which they have three different contracts totaling 1250 units. These are built from the wheels on up and they soon expect to be turning cars out at the rate of 12 a day. The company has just finished rebuilding 1000 cars of a similar type and many of these had to be reworked completely.

Northwest Steel Rolling Mills is operating at a rate which is taxing ingot capacity to the full extent. An inventory of 3000 tons of ingots has been depleted and the rolling mill is finishing all ingots as they are produced. The management is anticipating a shut down of the rolling mill for a 2-week vacation period next month and will keep the furnaces working to build up a reserve supply of ingots.

Although the labor situation has quited down locally somewhat with the settlement of the machinists' strike against the Washington Metal Trades, Inc., pickets were still in evidence at the Kenworth Motor Truck Corp. which is going through its third strike in less than a year, and the aeronautical mechanics union which voted to strike against the Boeing Aircraft Co. is awaiting sanction from its international.

Until recently there was feeling among Boeing workers that if the strike was actually called it would be of short duration, but now there has been a shift in this thinking and the consensus is that a strike might well be drawn out.

Boeing could, in the event of a local strike, have much of its work done at Wichita, Kan., and would probably rely more heavily on subcontractors locally. Many of the local workmen are frank to tell you that they are not too happy over the prospects of a prolonged strike, but at the same time insist that they are going to stick by their original demands. Meetings of management and labor with a government negotiator had failed to bring about anything approaching a settlement up to late last week.

LOS ANGELES — Progressive disintegration of the air forces, the air industry and the entire national defense establishment is resulting from the present production of only 100 military aircraft per month, according to Capt. Leland D. Webb (U.S.N., Ret.), western regional manager of the Aircraft Industries Assn.

Addressing the national convention of the Aviation Writers Assn., Captain Webb asserted that military aircraft production in 1946 was one eightieth (1330 planes) of the 1944 level. Production in 1947 is at the 100 per month level, not even enough to provide replacements in our present air force. The current rate is less than half the safety minimum recommended by the official Air Coordinating Committee.

Citing the critical position of the nation's aircraft industry, Captain Webb called for the immediate establishment of a national air policy. He stressed the necessity of a long-range program of planning to insure the maintenance of a strong air force and a healthy aircraft industry. "Managements," he said, "can make no rational plans so long as their volume and production are unknown. As things stand now, no aircraft manufacturer knows what his tasks are."

* * *

A new turbo-jet engine, more powerful than a diesel electric railroad engine and less than 0.2 pct of a diesel's weight, has been announced after 6 years of secret development. The engine, said to be America's most powerful turbo-jet, produces a rated thrust up to 5000 lb. Menasco Mfg. Co., Burbank, Calif., developed the engine, designated XJ-37, under the sponsorship of the Army Air Forces. Static test runs are now under way at the Menasco factory. Design, development and component testing have been carried out by both Menasco and Lockheed Aircraft Corp.

The XJ-37 can be applied either as a pure jet engine or as a turbine

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with propeller. An extremely small frontal area facilitates installation in either wing or fuselage with minimum drag of nacelles or inlet ducts. Efficient fuel consumption is said to guarantee long range and offer a high thermal efficiency. Nathan C. Price, vice-president in charge of engineering, Menasco Mfg. Co., invented the new engine.

* * *

"The development of rockets as uninhabited missiles capable of being fired to any point on the face of the earth appear to be within the realm of possibility in the relatively near future," E. H. Heinemann, chief engineer, Douglas Aircraft El Segundo plant, told the American Society of Mechanical Engineers national aviation meeting here. Everyday rocket travel, however, appears to be remote, Mr. Heinemann pointed out.

"The greatest unsolved problems in this field are generally considered to be those of obtaining satisfactory guidance and control," he went on.

"Since rockets operate most efficiently above the earth's atmosphere, the problem of using them for human transportation is somewhat more complicated due to the necessity of reentering the atmosphere at several hundred miles per hour and landing safely. Everyday rocket travel, therefore, appears to be in the distant future," Mr. Heinemann said.

* * *

Bethlehem Pacific Coast Steel Corp. has started installation of a 50-ton electric furnace at its plant here. This will be the largest furnace of its kind on the Coast.

SALT LAKE CITY—How Geneva Steel Co. reduced by 37 pct the amount of coal necessary to produce 1 net ton of pig iron at the Geneva, Utah, plant was described by C. L. Waggoner, general plant superintendent, at the annual meeting of the Rocky Mountain Coal Mining Institute.

When the Geneva operation started, 4651 lb of coal were used per net ton of iron. By varying the pulverizing practice to increase bulk density of the coal charge; by increasing the oven temperature to eliminate or decrease the amount of uncoked coal; and by adding pitch (4½ pct at present) to supply a deficiency in coking medium; this high ratio was reduced to 2900 lb of coal per net ton of iron.

Mr. Waggoner said he did not mean to imply by his recital of Geneva's experience that the matter of suitable coking coal in the West had been completely disposed of.

"But I do suggest," he added, "that coal looked upon with serious misgivings as to its quality has been shown to be amenable to treatment and it now remains for us to develop the most economical method of producing a thoroughly suitable coke for our use. Also from the viewpoint of coal conservation and economy it is entirely possible that there is unknown to us as yet a coal or other material, which when properly treated and blended with the presently known coals of the West, would have the same effect on our western economy that the blending of coals—compared to the use of Connellsville, Pa., coal by itself — had on the eastern economy. . . . Let us say we have found a way of living until we learn how to live better."

* * *

Wage negotiations for the nonferrous metal mining industry are under way this week in this area. The first hurdle to be cleared—and prospects are that it will be a difficult one—is whether the contracts will be reopened on anything but the wage scale.

When Utah and Nevada operators signed a contract last year after a 5-month strike they won a 2-year agreement with wages subject to adjustment at the end of 1 year. Anticipating that efforts would be made to reopen contracts on all issues, they insisted upon contract wording limiting the reopening specifically to "the wage scale." But some union officials have indicated they will seek to reopen on everything bearing on wages, which would virtually mean the negotiation of a new set of contracts. The operators are expected to stand firm against reopening on anything but "wage scales."

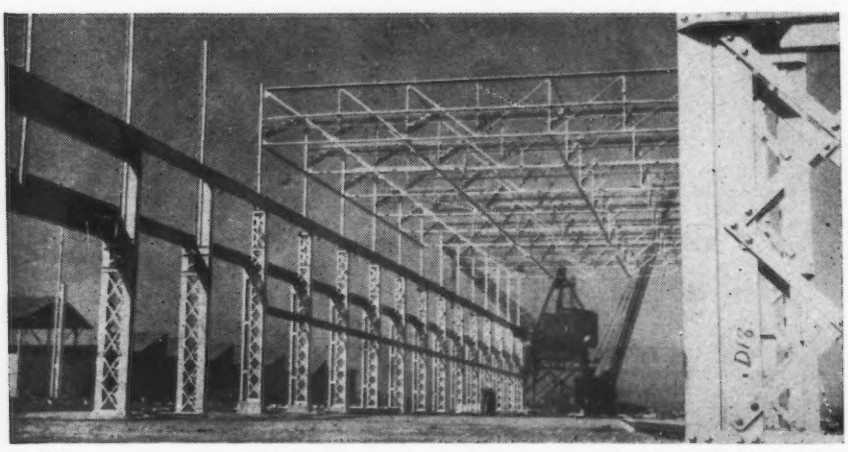
Another preliminary issue which may stalemate the negotiations before wages are reached is bargaining on a company-wide basis. The International Union of Mine, Mill & Smelter Workers has formally adopted a policy of organizing councils to bargain company-wide. The operators heretofore have insisted on bargaining at the local plant level or on an area basis.

* * *

Sale of the government-owned vanadium plant in Salt Lake City to the Structural Steel & Forge Co. on a bid of $81,400 was recently approved by WAA. The Rosenblatt family, which owns and operates three local steel fabricating firms (Structural Steel & Forge, EIMCO and American Foundry & Machine Co.) plans to raze the vanadium plant buildings and use the 3-acre site for a new plant to produce finished steel building items. Construction will start in the near future.

Acquisition cost of the government plant was about $200,000.

FABRICATED FOR FABRICATOR: *This skeleton will eventually house the new plant of Apex Steel Corp., Ltd., Los Angeles which is engaged in* $400,000 *expansion program on new* 10½ *acre site scheduled for completion late this month.*



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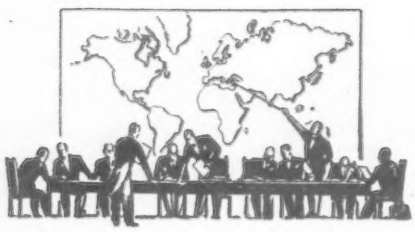
European Letter . . .

• Bridging the gap between imports and exports considered greatest economic problem to be faced . . . Recovery depends upon United States.



LONDON—The British Chancellor of the Exchequer was certainly not exaggerating when he described the problem of bridging the gap between imports and exports as "by far the greatest and gravest of the immediate economic problems to be faced," on which depended "the whole future of our country and the standard of life we shall enjoy in the years to come." Mr. Dalton was speaking of the British problem. But his canvas might well have been much larger.

The same specter stands at Monsieur Ramadier's elbow as he struggles with the spiral of wages and prices in France. It haunts Signor de Gasperi's efforts to form a new Italian cabinet. It mocks all the efforts that are being made to keep the people of Western Germany from starvation and utter despair. More and more, as week succeeds week, the whole of European life is being overshadowed by the great dollar shortage.

The margin between recovery and collapse throughout Western Europe is dependent at this moment upon massive imports from the United States. The economic dislocation left behind by the second German war is proving to be far greater and far less tractable than the legacy of the first.

There is no quick return to normalcy this time; indeed, in many respects, conditions are getting worse, not better. The International Emergency Food Council, at its fourth meeting, has declared that food stocks are at their lowest ebb and that next winter's shortages may be the worst yet experienced.

The prospect that faces the British people is both more and less promising than those with which the Continental nations are wrestling. Britain is fortunate in having access to a line of dollar credits which, even on the worst supposition, will last through next winter.

But, on the other hand, Britain is so much more dependent on imports for supplies both of food and of raw materials that a complete lack of means of payment would be much more painful here than elsewhere. The seriousness of the position is still not realized; there are still voices that can say, as Miss Jennie Lee said at Margate recently, "Let us decide not to go to America begging again."

BUT the decision is not Miss Lee's to take; it is not the Labor Party's; it will not even, in the end, be the government's. The decision will be taken by the unpleasant facts. It is wholly right that nobody in Britain should, in Mr. Dalton's words, "count on raising any further overseas credits"

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and that, at this stage, the problem should be envisaged as one of increasing exports and cutting imports until they balance.

But those who think this is a policy that is easy or agreeable, or that it is possible at all without bringing on a first-class economic crisis, should be invited to study the facts and to say exactly which imports they would cut out — and how they would manage to increase the activity of the export trades while reducing their supplies of raw materials and the rations of their workers.

It is very unpleasant to have to admit such a large dependence on borrowed dollars so long after the end of the war. But unpleasant facts are no less facts for being unpleasant.

If the reality of the dollar crisis is so little appreciated by those who would most suffer from it, there is little cause for wonder that it is still less appreciated in America. It is not, indeed, wholly ignored. There have been several signs in recent weeks that the administration is becoming increasingly worried about it. Mr. Dean Acheson's last act before leaving office was to remind the American people of their economic responsibilities. The Secretary of State has set up within the State Dept. a special planning staff charged with the responsibility of estimating the world's needs and relating them to American resources, and there is talk of a special session of Congress to be summoned in the autumn to consider a comprehensive program.

Moreover, private citizens of influence and vision are busy issuing their warnings. Mr. Walter Lippman, for instance, has argued that only the resumption of something on the scale of Lend-Lease can meet the crisis. And Harold Stassen, returning from his European tour, has boldly urged the United States to devote one tenth of its annual production to a 10-year plan for rebuilding the world, specifically renouncing any right to repayment in dollars or manufactured goods.

BUT these voices are not representative of the majority of American public opinion. Mr. Randolph Burgess, in his recent speech to the American Chamber of Commerce in London, was accurately reflecting the mood of his colleagues of the financial community when he poured cold water on the notion that commercial lending could be relied upon to close the enormous gap in the American balance of payments.

American investors, he pointed out, "took an awful shellacking" over foreign loans after the first world war. Nor are the existing governmental finance institutions likely to be much more helpful. The Export-Import Bank has now returned to its proper field—"a useful but limited area to supplement and encourage bank financing of trade . . . its charter excludes reconstruction loans."

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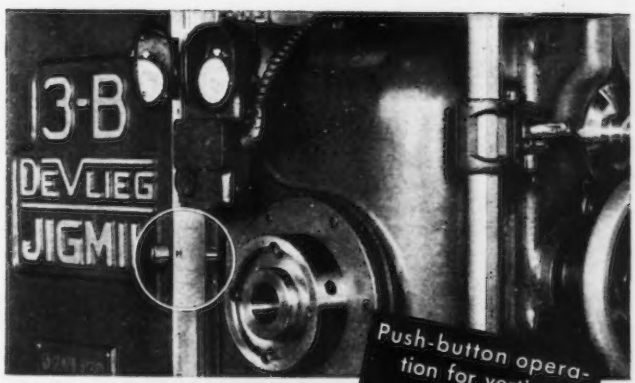
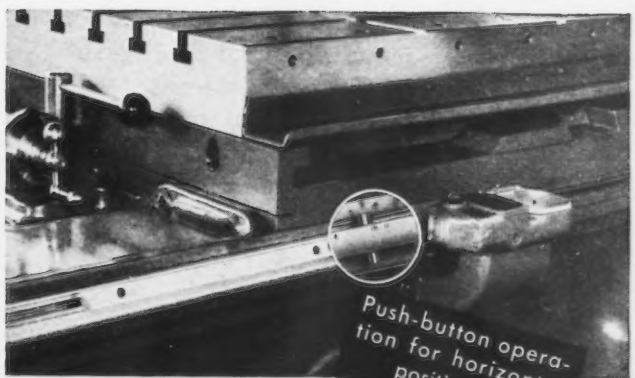
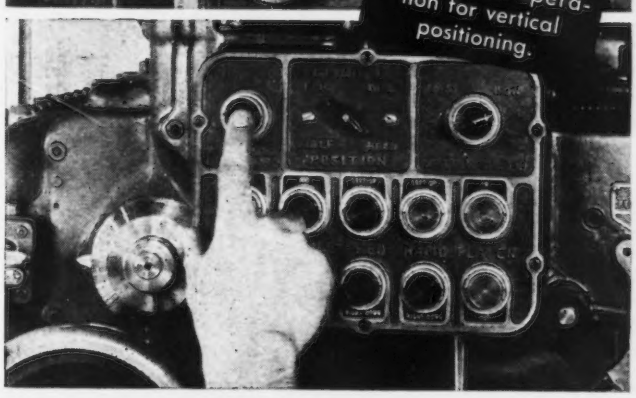
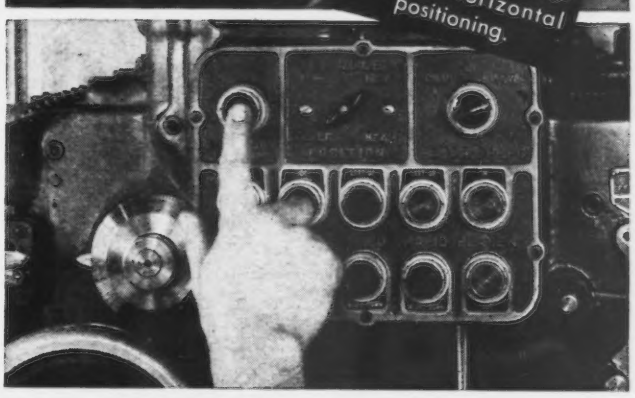


Push-button operation for vertical positioning.



Push-button operation for horizontal positioning.





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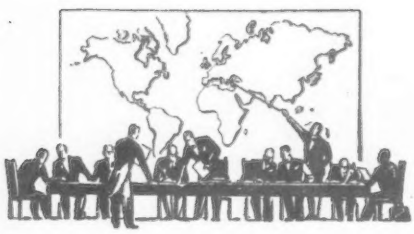
European Letter . . .

• Bridging the gap between imports and exports considered greatest economic problem to be faced . . . Recovery depends upon United States.



LONDON—The British Chancellor of the Exchequer was certainly not exaggerating when he described the problem of bridging the gap between imports and exports as "by far the greatest and gravest of the immediate economic problems to be faced," on which depended "the whole future of our country and the standard of life we shall enjoy in the years to come." Mr. Dalton was speaking of the British problem. But his canvas might well have been much larger.

The same specter stands at Monsieur Ramadier's elbow as he struggles with the spiral of wages and prices in France. It haunts Signor de Gasperi's efforts to form a new Italian cabinet. It mocks all the efforts that are being made to keep the people of Western Germany from starvation and utter despair. More and more, as week succeeds week, the whole of European life is being overshadowed by the great dollar shortage.

The margin between recovery and collapse throughout Western Europe is dependent at this moment upon massive imports from the United States. The economic dislocation left behind by the second German war is proving to be far greater and far less tractable than the legacy of the first.

There is no quick return to normalcy this time; indeed, in many respects, conditions are getting worse, not better. The International Emergency Food Council, at its fourth meeting, has declared that food stocks are at their lowest ebb and that next winter's shortages may be the worst yet experienced.

The prospect that faces the British people is both more and less promising than those with which the Continental nations are wrestling. Britain is fortunate in having access to a line of dollar credits which, even on the worst supposition, will last through next winter.

But, on the other hand, Britain is so much more dependent on imports for supplies both of food and of raw materials that a complete lack of means of payment would be much more painful here than elsewhere. The seriousness of the position is still not realized; there are still voices that can say, as Miss Jennie Lee said at Margate recently, "Let us decide not to go to America begging again."

BUT the decision is not Miss Lee's to take; it is not the Labor Party's; it will not even, in the end, be the government's. The decision will be taken by the unpleasant facts. It is wholly right that nobody in Britain should, in Mr. Dalton's words, "count on raising any further overseas credits"

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and that, at this stage, the problem should be envisaged as one of increasing exports and cutting imports until they balance.

But those who think this is a policy that is easy or agreeable, or that it is possible at all without bringing on a first-class economic crisis, should be invited to study the facts and to say exactly which imports they would cut out — and how they would manage to increase the activity of the export trades while reducing their supplies of raw materials and the rations of their workers.

It is very unpleasant to have to admit such a large dependence on borrowed dollars so long after the end of the war. But unpleasant facts are no less facts for being unpleasant.

If the reality of the dollar crisis is so little appreciated by those who would most suffer from it, there is little cause for wonder that it is still less appreciated in America. It is not, indeed, wholly ignored. There have been several signs in recent weeks that the administration is becoming increasingly worried about it. Mr. Dean Acheson's last act before leaving office was to remind the American people of their economic responsibilities. The Secretary of State has set up within the State Dept. a special planning staff charged with the responsibility of estimating the world's needs and relating them to American resources, and there is talk of a special session of Congress to be summoned in the autumn to consider a comprehensive program.

Moreover, private citizens of influence and vision are busy issuing their warnings. Mr. Walter Lippman, for instance, has argued that only the resumption of something on the scale of Lend-Lease can meet the crisis. And Harold Stassen, returning from his European tour, has boldly urged the United States to devote one tenth of its annual production to a 10-year plan for rebuilding the world, specifically renouncing any right to repayment in dollars or manufactured goods.

BUT these voices are not representative of the majority of American public opinion. Mr. Randolph Burgess, in his recent speech to the American Chamber of Commerce in London, was accurately reflecting the mood of his colleagues of the financial community when he poured cold water on the notion that commercial lending could be relied upon to close the enormous gap in the American balance of payments.

American investors, he pointed out, "took an awful shellacking" over foreign loans after the first world war. Nor are the existing governmental finance institutions likely to be much more helpful. The Export-Import Bank has now returned to its proper field—"a useful but limited area to supplement and encourage bank financing of trade . . . its charter excludes reconstruction loans."

The International Bank's lending powers depend very largely on its

THIS IS DUPLITROL . . .

. . . FOR MAKING REPETITIVE PARTS *WITHOUT JIGS!*

2 ¾ x ¾ C.R.S. **BARS** *ONE* HORIZONTAL *ONE* VERTICAL . . . with ¼" holes machined at the desired spacing.

+ **2** HARDENED **PINS** . . . used to select locations according to the desired pattern of holes.

+ *Automatic* **POSITIONING** . . . accurately and dependably provides foolproof spacing for machining repetitive parts *without jigs.*

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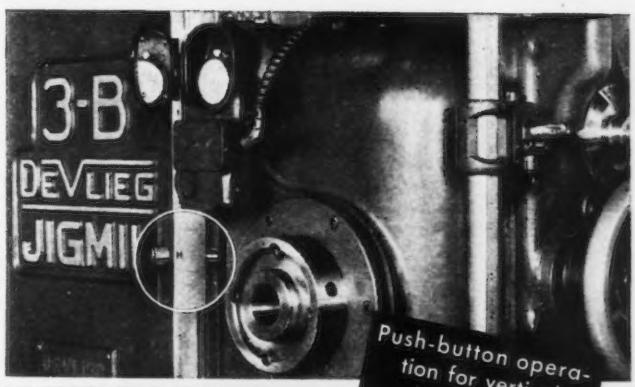
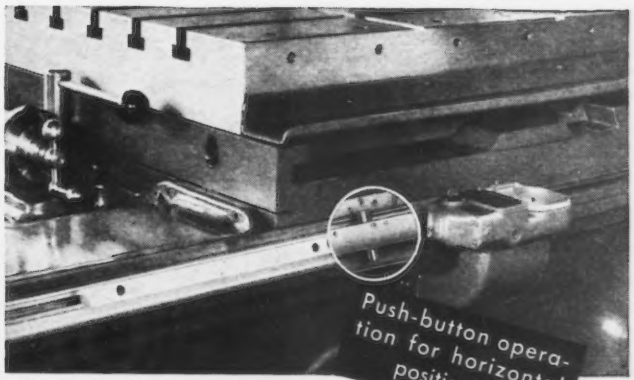
The finest known process for accurately spacing and machining holes.

THIS IS HOW IT WORKS . . .

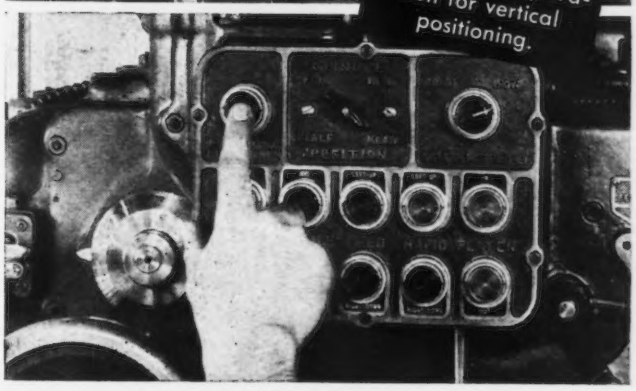
Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 3B DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.

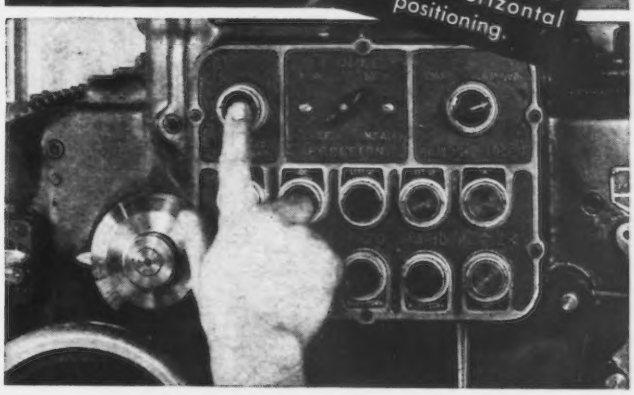


Push-button operation for vertical positioning.



Push-button operation for horizontal positioning.





DeVLIEG MACHINE COMPANY — DEVLIEG JIGMIL — 450 FAIR AVE. FERNDALE 20, (Detroit) MICH.

borrowing powers, and the buyer of debentures wants to know what happens when the loans go to about $4 billion. The skepticism about foreign loans is great enough, so that it is a real and not imaginary problem. It will, in fact, be one reason why you will find the Bank operating with care and conservatism, more so than some Europeans will like.

Mr. Burgess would have been more helpful if, in addition to accurate reflection of Wall St. opinion, he had followed his logic to the obvious conclusion—that if the dollar gap cannot be filled privately and commercially, it will have to be filled governmentally and noncommercially.

But any such conclusion, however logical it may be, runs entirely counter to the dominant philosophy of the moment in America. There is certainly no sign that any member of Congress is following logic to any such conclusion.

On the contrary, the mood of Congress seems to be more Cooldigean than Rooseveltian. The Senate has been persuaded only with the greatest difficulty — and the House of Representatives has not yet been persuaded at all—to refrain from enacting a sharp increase in the tariff on raw wool, and thus bringing the Geneva Conference to an abrupt end.

AMERICAN opinion, and the policy of the United States, can swing round very rapidly. They have done so before. Indeed, there is something in the present situation that is very reminiscent of 1940, when also it was very clear that Europe could only be saved by America, but nobody could see how America could be persuaded, in time, to undertake the rescue operation.

In 1940, the persuasion was done by a clear proof of the dire necessity, and by a no less clear demonstration that American efforts would not be in vain nor American assistance wasted. In the crisis of 1947, perhaps it is the second demonstration that is the more necessary. It is probably true at the present moment that American opinion needs more reassurance on the ultimate strength and vitality of Britain and Europe than reminders of their present plight.

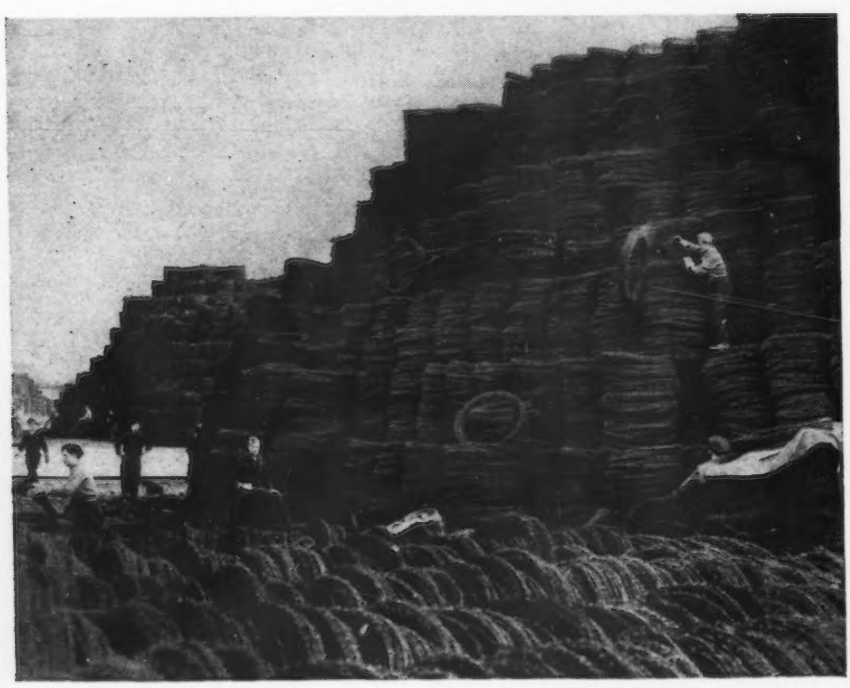
If the dollars that are so desperately needed could somehow be represented not merely as assistance to the improvident but as the foundation of some good constructive purpose, then there might be a greater chance of eliciting a favorable response.

Many people, on both sides of the Atlantic, have in recent weeks, seen the possibility of such a constructive approach in the idea of a closer association of the nations of Western Europe. During the war, and for some time after it, the idea of a "Western bloc" was looked upon in Washington with almost as much disfavor as in Moscow. It offended against the then dominant canon of "One World," and there can be little doubt that it was this chill disapproval that, more than anything else, prevented any progress from being made with the idea at the time when it could most easily have been promoted.

But since American policy has swung round to the doctrine of "Two Worlds" and has been increasingly immersed in the problem of rehabilitating Germany, the idea of "the United States of Western Europe, to be extended some day to "the United States of Europe" has had an almost spectacular rise in favor in America.

It is conceivable that a gigantic program of economic aid—almost, if not entirely, reaching Stassen's dimensions—would find favor if it were a Launching Loan for such a large conception — new, promising and progressive — while considerably smaller sums, if presented as requests for further credit to individual nations already in debt and believed to be senescent, might have a much more difficult passage. This might conceivably be the grandiose program that would fire the American imagination and touch the twin chords of generosity and idealism that inspire so many American actions.

TABLES TURNED: *German prisoners of war work on thousands of tons of British barbed wire, requisitioned for anti-invasion measures early in the war. The Ministry of Supply announced that the Argentine Government had bought the wire but the stack has not diminished appreciably.*

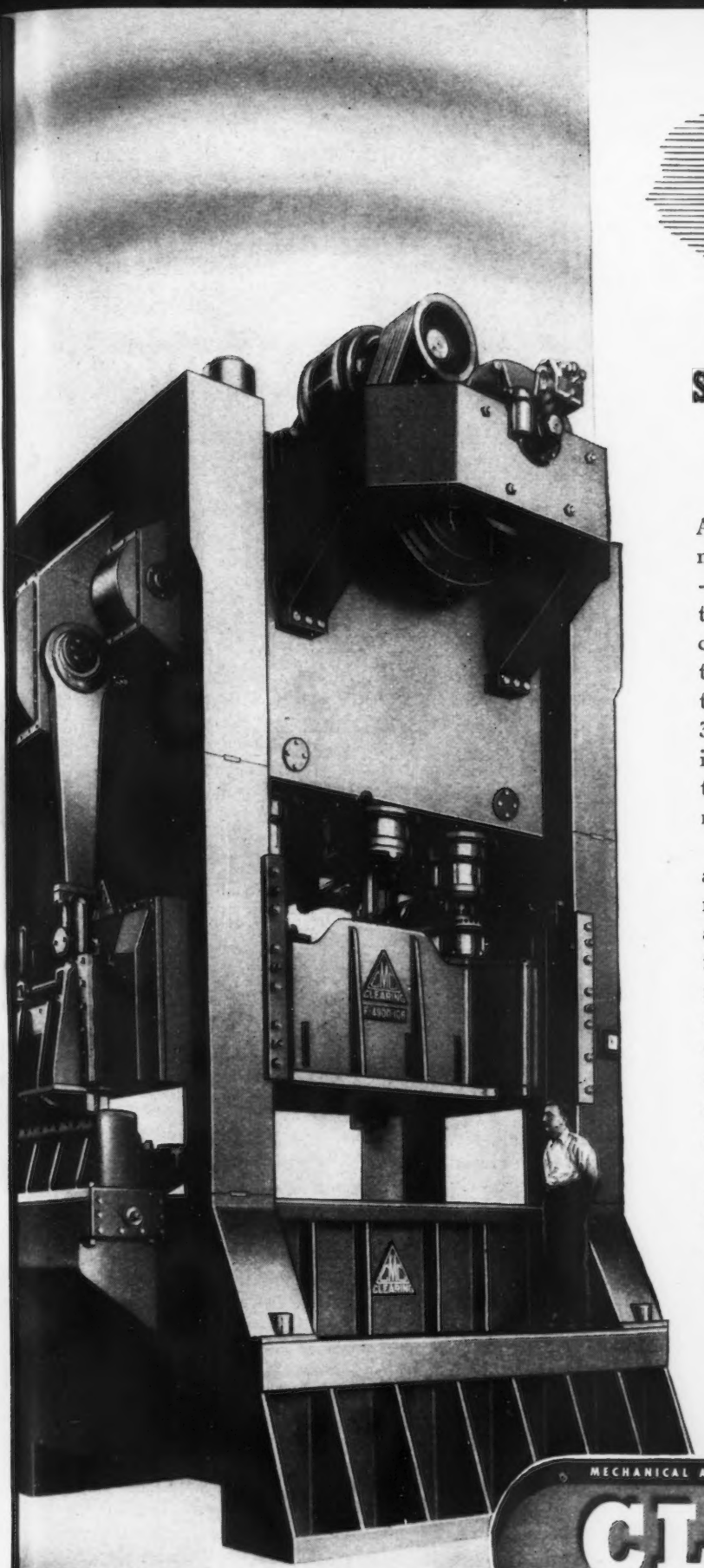


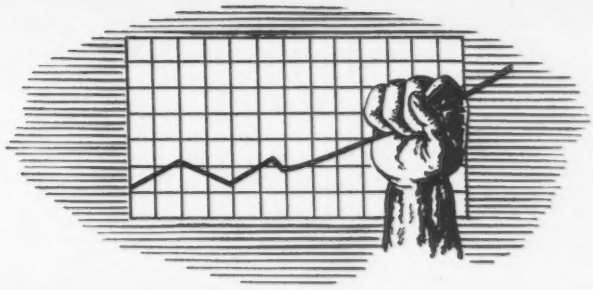
French Loan Approved

New York

• • • **Following the** announcement of the ratification of a $250 million loan from the International Bank by the French government, details have been released which indicate how the money will be spent. A first section of the load will be utilized to finance a reconstruction program the details of which have already been announced, including the $11,000,000 for the hot strip mill at Denain.

The rest of the first segment of $54 million will be broken up for other industries, including the following: $10 million for the purchase of tankers, Liberty ships, and other merchant vessels; $12 for cold reduction mill and auxiliary equipment.





SPEEDING PRODUCTION with a 900-TON Push

Automatic feed, high speed production is not new or unusual in blanking operations—but when the blank is 27" in diameter and the stock is .90 carbon steel, 3/16" thick, it ceases to be an ordinary job. Clearing built this press to just those specifications, and the press is now delivering for its owner at 36 strokes per minute. Besides the blanking, the press cuts the scrap as it emerges, thus saving a separate operation and further reducing production costs.

Here's a 900-ton press working with the accuracy and speed you might expect in a much smaller machine. Clearing has been able to achieve results like this because from the day it was founded Clearing has refused to be hampered by conventional but unsupported beliefs. That's why you'll find Clearing presses in the most modern, most efficient plants throughout the world. It's also why a Clearing press is invariably a profitable investment.

Whatever your problem—whether you require a giant machine or a small inclinable press—put your facts and requirements in the hands of Clearing engineers for the most satisfactory and profitable answer.

MECHANICAL AND HYDRAULIC PRESSES ★ 45 TONS CAPACITY AND LARGER

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THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

PERSONALS

o o o

• **George H. Pratt** has been elected vice-president in charge of sales of the Hudson Motor Car Co., Detroit. Mr. Pratt joined Hudson in 1927. In 1937 he was appointed sales manager and in 1939, general sales manager.

• **Frederick J. Garbarino** has become manager of bearing applications of the New Departure Div. of General Motors Corp., Bristol, Conn. He joined New Departure in 1935, and was assigned to the automatics department. Two years later he joined the engineering department, and until this appointment held the position of project engineer on aircraft instruments. **Leland D. Cobb** has been made manager of research and development. Mr. Cobb, since 1928, has held a wide variety of positions, including drafting engineer, laboratory engineer, textile engineer, executive engineer, and cost engineer on the staff of the general manager. **S. Robert Large** has been designated bearing products engineer, and **Salvatore F. Marino** has been appointed bicycle products engineer.

• **Milton F. Lepper** has become associated with the Max Solomon Co., Pittsburgh, as a representative. Mr. Lepper was formerly connected with the purchasing department of the Jones & Laughlin Steel Corp.

• **William G. Findlay** has been appointed manager of the Pittsburgh plant of Joseph T. Ryerson & Son, Inc. He succeeds **Howard L. Robinson** who has been given a special assignment at the Cleveland plant of the company. Mr. Findlay has been associated with Ryerson for 25 years. For 11 years he served as manager of the work order department at the company's Detroit plant, leaving there in 1939 to become work order division head at Chicago. The new manager of the work order department at Chicago is **C. W. Schoenberg.** For the past 14 years he held a similar position at the Ryerson steel-service plant in Milwaukee.

• **James Poulson** has been shifted to the Pacific Coast, with headquarters in the Los Angeles office of the Wyandotte Chemical Corp. Mr. Poulson has serviced Wyandotte industrial accounts in the Milwaukee territory since 1938.

• **Tony Reitberger** has been appointed assistant chief engineer of the Warren City Mfg. Co., Warren, Ohio. Before joining Warren City, he was with the Clearing Machine Corp. for 10 years as design engineer and engineering department head in charge of the heavy mechanical press division.

J. G. PAULE, vice-president and assistant general manager, Wilson Foundry & Machine Co.

• **J. G. Paule** has been appointed vice-president and assistant general manager of Wilson Foundry & Machine Co., Pontiac, Mich. Mr. Paule, who has been associated with Wilson since 1937, formerly served as secretary and treasurer. He will be succeeded in that capacity by **Myron Hill,** formerly comptroller. **B. E. Drury** has been promoted to general sales manager. He formerly served as sales manager and prior to that time was assistant to the vice-president in charge of sales.

• **Terry P. Cunningham** has been appointed advertising manager of the radio tube, electronics and international divisions of Sylvania Electric Products Inc., New York. He served as advertising manager for Sylvania's radio tube division for 2 years before becoming sales manager for the home radio division of Colonial Radio Corp., a Sylvania subsidiary, in 1944.

• **Floyd E. Watson,** Salt Lake City district sales manager for the Colorado Fuel & Iron Co., Denver, since 1941, has been advanced to the position of manager of sales of wire products for the Colorado Div. of the corporation. His successor in Salt Lake City is **James N. Counter,** who has been district sales manager at Phoenix, Ariz.

• **Charles S. Northen,** sales manager of Sloss-Sheffield Steel & Iron Co., Birmingham, has been promoted to vice-president in charge of sales.

• **Ward Raymond,** president of Pennsylvania Pump & Compressor Co., Easton, Pa., has resigned and is succeeded by **Ellis R. Snovel,** former vice-president.

• **Carl G. Buck** has been elected president and treasurer of the Fairfield Barrel Co., Fairfield, Ala. **Maj. Walter S. Buck,** who has returned from the Armed Forces, resumes his position as vice-president and in charge of sales.

• **Charles M. Mapes** has been appointed industry manager in charge of aluminum foil sales for the consumer goods program at Reynolds Metals Co., Richmond, Va. He was associated for many years with the Scott Paper Co.

• **C. F. Moersch, Jr.** has been named sales engineer for Vulcan Mold & Iron Co., Latrobe, Pa. Mr. Moersch was previously employed by Vanadium-Alloys Steel Co.

• **John A. Worthington** has been appointed general sales manager of the piston ring division of Koppers Co., Inc., Baltimore. **T. Latimer Ford,** who has been with Koppers or its affiliates since 1908, will head up a new company department devoted exclusively to replacement sales. Mr. Worthington joined the Bartlett Hayward Co., now a division of Koppers, in 1916 starting as an inspector and in 3 years he became a foreman. In 1920 he was transferred to the American hammered piston ring division as assistant shop superintendent. Two years later he became an engineer in that division and since 1925 has been manager of industrial sales and engineering.

• **Charles F. Kettering** has retired as vice-president in charge of the research laboratories and **John T. Smith** has retired as vice-president and general counsel of General Motors Corp., New York. **Charles L. McCuen,** vice-president in charge of the engineering staff, will become general manager of the research laboratories division, succeeding Mr. Kettering. **James M. Crawford,** who has been general assistant to Mr. McCuen, has been elected vice-president in charge of the engineering staff to succeed Mr. McCuen. **Henry M. Hogan,** vice-president and assistant general counsel, has been elected general counsel to succeed Mr. Smith. Mr. Smith will continue to serve as a director of the corporation and as a member of the financial policy committee. Mr. Kettering likewise will remain a director and will be a consultant.

• **James H. Binger** has been elected assistant vice-president of the Minneapolis-Honeywell Regulator Co., Minneapolis. He had been assistant secretary of the company since 1945, from which position he has resigned to assume his new duties.

• **Howard O. Lund,** assistant sales manager in charge of western territory, has been named sales manager for Willys-Overland Motors, Toledo. Mr. Lund, who has been with Willys-Overland since 1945, replaces **George H. Bell** who has resigned.

• **Dr. Charles A. Thomas,** vice-president and technical director of Monsanto Chemical Co., St. Louis, has been elected executive vice-president of that organization. **Felix N. Williams,** vice-president and general manager of the company's plastics division, has been elected to the board of directors. Five additional vice-presidents have been elected, as follows: **Josiah B. Rutter,** general manager of the company's Merrimac Div.; **Dr. C. A. Hochwalt,** director of the central research department; **William W. Schneider,** secretary and head of the legal department; **Daniel M. Sheehan,** comptroller; and **C. A. Wolfe,** director of purchases and traffic.

GEORGE M. THURSBY (left), vice-president in charge of industrial relations, H. C. Frick Coke Co., and WILLIAM FOSTER (right), secretary and general attorney, H. C. Frick Coke Co. and U. S. Coal & Coke Co.

• **George M. Thursby** has been elected vice-president in charge of industrial relations and **William Foster,** secretary of H. C. Frick Coke Co., Pittsburgh, subsidiary of U. S. Steel Corp. Mr. Foster also has been elected secretary of U. S. Coal & Coke Co. He will continue his former position as general attorney for both subsidiaries. Mr. Thursby has been director of industrial relations for Frick and associated companies since 1944. He started with U. S. Steel in 1921, was appointed casualty manager for Frick in 1935, and became assistant secretary in 1939. **George W. Sweeny** has been elected vice-president of U. S. Coal & Coke Co. Mr. Sweeny will continue his present position as vice-president, H. C. Frick Coke Co., and as auditor of U. S. Coal & Coke and associated Frick companies. He began with Frick as paymaster in 1908 and held various positions until his election as vice-president in 1940. He was secretary and treasurer of the company for 13 years preceding that.

• **Franklin C. Schimpf** has been appointed controller of Link-Belt Co., with headquarters in Chicago. Mr. Schimpf joined the Link-Belt organization in 1905 as an errand boy in the cost accounting department of the company's Philadelphia plant. Before his promotion, he was assistant secretary of the company, which position he had held since 1942.

• **N. H. Schlegel,** who has been advertising manager of Cory Corp., Chicago, for the past year, has been named director of advertising and sales promotion. In his new capacity he will head all public relations and sales promotion of Cory Corp. in addition to continuing as head of advertising.

• **Edward Boehm** has resigned as vice-president, treasurer, director and member of the executive committee of Gar Wood Industries, Inc., Detroit.

• **Robert A. Olen,** general manager of the Four Wheel Drive Auto Co., Clintonville, Wis., has been elected a member of the board of directors to succeed **Charles Hagen,** deceased.

• **J. M. Davies** has been promoted to associate director of research in administrative charge of the research department of Caterpillar Tractor Co., Peoria, Ill. **R. C. Williams** has been named assistant director of research in charge of tractor and earthmoving projects. Mr. Davies joined Caterpillar in 1925, as a member of the engineering laboratory at the San Leandro, Calif. plant, and when the research department was formed in 1942, he became assistant director of that department. Mr. Williams joined the company in 1932, as an engineering trainee, and in 1945 assumed the duties of a staff engineer.

C. E. KENDALL (left), manager of sales, wire products, and H. A. KNOX (right), manager of sales, tin mill products, Jones & Laughlin Steel Corp., whose appointments were announced in the May 29 issue.

• **Joseph H. Gillies,** vice-president in charge of radio production, and **Robert F. Herr,** vice-president in charge of Philco Corp.'s service division, Philadelphia, have been elected to the board of directors.

• **Joseph T. Wilson** has been promoted to the position of vice-president of International Business Machines Corp. of Delaware, the affiliate which administers IBM business in Argentina, Brazil, Peru, Chile and Cuba. He was previously manager of the IBM world trade division. **Arch Davis,** executive secretary, has been promoted to the new position of IBM special executive, with special duties to assist IBM corporate officers and officials at its headquarters in New York. **Byne B. Waters,** general secretary, has been made executive secretary, succeeding Mr. Davis.

• **C. Thomas Miller** has been named eastern regional manager of appliance sales for Rheem Mfg. Co. and will make his headquarters in New York. He replaces **W. W. Stevens** who has resigned. Mr. Miller joined Rheem in 1942 and was assigned to the Baltimore engineering department. During the war he handled procurement of machine tools. He was made sales manager of the Baltimore district in 1945 and in 1946 was transferred to the New York office as assistant to the general manager of appliance sales.

• **J. H. Scott** has been appointed sales representative by Gibson Electric Co., Pittsburgh. His territory will cover Watertown, N. Y., and Binghamton, N. Y., as well as all of New York state west of these cities.

• **Henry Dersofi** has been appointed manager of material assembly of American Car & Foundry Co., New York. He replaces **S. S. Dunn,** who has retired. Mr. Dersofi entered the employ of ACF in 1940 to work in their traffic department and subsequently was transferred to the purchasing department, where he served in various capacities until his recent appointment.

• **Dennis F. McCarthy,** who has been with the sales department of the A. O. Smith Corp., Milwaukee, for the past 11 years, has been named manager of the newly created tubular goods department there.

• **Harold Norman** has resigned as vice-president and general manager of the Heinn-Werner Motor Parts Co., Waukesha, Wis.

• **Fred Olsen,** since 1929 chief of research and technical development, of the Western Cartridge Co., division of Olin Industries, Inc., at East Alton, Ill., has been elected a member of the board of directors of Olin Industries, Inc.

• **Ernest E. Michaels,** Chicago Bridge & Iron Co. vice-president and manager of the company's plant at Birmingham, has been promoted to general manager of the company's operations. **Amasa G. Smith,** former plant superintendent at Birmingham, succeeds Mr. Michaels as manager there.

• **Richard K. Lee** has been appointed to the position of technical director of Alloy Rods Co., York, Pa. He had been previously associated with the Steel & Tube Div. of the Timken Roller Bearing Co.

...OBITUARY...

• **George A. Hastings,** 69, president of the Austin-Hastings Steel Co., Boston, died suddenly May 26. He became associated with the firm when it was the Austin & Doten Co., of which he was made president and general manager in 1926.

• **Cornelius A. Brosnan,** 71, founder and former president-treasurer of Worcester Pressed Aluminum Co., Worcester, Mass., died recently.

• **John E. Stamp,** 56, machinery supervisor at Brown & Sharpe Mfg. Co., Providence, died recently.

• **Charles F. Dishaw,** 71, former owner of the Dishaw & Dishaw Foundry, Canton, N. Y., died recently after a long illness. He had been associated with Oberdorfer Bros. Foundry in Syracuse prior to his retirement last year.

• **Nathan Alexander,** 46, vice-president in charge of purchasing of the American Safety Razor Corp., died recently.

• **George E. Price, Jr.,** 57, purchasing agent for Goodyear Tire & Rubber Co., Akron, Ohio, and associated with the company for 25 years, died May 30 after a short illness.

• **John A. Bennan,** 69, chairman of Jefferson Electric Co., Bellwood, Ill., died Apr. 17.

How to Plan Your Toolroom Heat Treating Department

This photo is typical of many shown in the "Toolroom" booklet. Miniature furnaces, 6" to 8" high are used to help visualize how various heat treat departments will look.

A NEW BOOKLET

Published to assist those planning new or expanded toolroom heat treating departments.

It tells how to select furnaces of the proper size . . .

. . . shows recommended layouts.

. . . gives approximate floor space requirements.

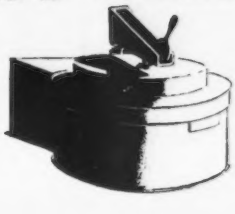
. . . shows what toolroom will cost, including auxiliary equipment such as tongs, quench tanks, straightening presses, work benches, hardness testers, etc.

. . . provides special "Template" Pages of furnaces, quench tanks, etc. to assist you in planning—a few seconds scissor-work shows you how your department will actually look.

Material in this book is based on first hand information gained from helping in the design of hundreds of toolrooms—plus additional information gathered from the experiences of our associate, Lindberg Steel Treating Company who operate one of the world's largest toolroom heat treating set-ups.

To get your copy write to your nearest Lindberg Engineering Company office, or to the Lindberg home office at 2452 West Hubbard St., Chicago 12, Illinois.

Detailed discussions cover: Selection of Proper Size furnaces, 2000°F. Maximum—High Speed Furnaces 2500°F. Maximum—Toolroom Tempering Furnaces • Production Work Combined With Tool Heat Treatment • Tilting Hearth Furnaces • Rotary Hearth Furnaces • Furnace Brazing • Laying Out The Toolroom Heat Treating Department • Quench Tanks • Cleaning of Work • Accessory Equipment.

LINDBERG  **FURNACES**

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• **C. Thomas Miller** has been named eastern regional manager of appliance sales for Rheem Mfg. Co. and will make his headquarters in New York. He replaces **W. W. Stevens** who has resigned. Mr. Miller joined Rheem in 1942 and was assigned to the Baltimore engineering department. During the war he handled procurement of machine tools. He was made sales manager of the Baltimore district in 1945 and in 1946 was transferred to the New York office as assistant to the general manager of appliance sales.

• **J. H. Scott** has been appointed sales representative by Gibson Electric Co., Pittsburgh. His territory will cover Watertown, N. Y., and Binghamton, N. Y., as well as all of New York state west of these cities.

• **Henry Dersofi** has been appointed manager of material assembly of American Car & Foundry Co., New York. He replaces **S. S. Dunn,** who has retired. Mr. Dersofi entered the employ of ACF in 1940 to work in their traffic department and subsequently was transferred to the purchasing department, where he served in various capacities until his recent appointment.

• **Dennis F. McCarthy,** who has been with the sales department of the A. O. Smith Corp., Milwaukee, for the past 11 years, has been named manager of the newly created tubular goods department there.

• **Harold Norman** has resigned as vice-president and general manager of the Heinn-Werner Motor Parts Co., Waukesha, Wis.

• **Fred Olsen,** since 1929 chief of research and technical development, of the Western Cartridge Co., division of Olin Industries, Inc., at East Alton, Ill., has been elected a member of the board of directors of Olin Industries, Inc.

• **Ernest E. Michaels,** Chicago Bridge & Iron Co. vice-president and manager of the company's plant at Birmingham, has been promoted to general manager of the company's operations. **Amasa G. Smith,** former plant superintendent at Birmingham, succeeds Mr. Michaels as manager there.

• **Richard K. Lee** has been appointed to the position of technical director of Alloy Rods Co., York, Pa. He had been previously associated with the Steel & Tube Div. of the Timken Roller Bearing Co.

...OBITUARY...

• **George A. Hastings,** 69, president of the Austin-Hastings Steel Co., Boston, died suddenly May 26. He became associated with the firm when it was the Austin & Doten Co., of which he was made president and general manager in 1926.

• **Cornelius A. Brosnan,** 71, founder and former president-treasurer of Worcester Pressed Aluminum Co., Worcester, Mass., died recently.

• **John E. Stamp,** 56, machinery supervisor at Brown & Sharpe Mfg. Co., Providence, died recently.

• **Charles F. Dishaw,** 71, former owner of the Dishaw & Dishaw Foundry, Canton, N. Y., died recently after a long illness. He had been associated with Oberdorfer Bros. Foundry in Syracuse prior to his retirement last year.

• **Nathan Alexander,** 46, vice-president in charge of purchasing of the American Safety Razor Corp., died recently.

• **George E. Price, Jr.,** 57, purchasing agent for Goodyear Tire & Rubber Co., Akron, Ohio, and associated with the company for 25 years, died May 30 after a short illness.

• **John A. Bennan,** 69, chairman of Jefferson Electric Co., Bellwood, Ill., died Apr. 17.

How to Plan Your Toolroom Heat Treating Department

This photo is typical of many shown in the "Toolroom" booklet. Miniature furnaces, 6" to 8" high are used to help visualize how various heat treat departments will look.

A NEW BOOKLET

Published to assist those planning new or expanded toolroom heat treating departments.

It tells how to select furnaces of the proper size . . .

. . . shows recommended layouts.

. . . gives approximate floor space requirements.

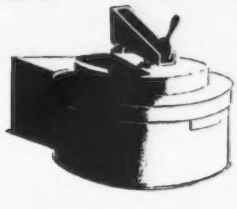
. . . shows what toolroom will cost, including auxiliary equipment such as tongs, quench tanks, straightening presses, work benches, hardness testers, etc.

. . . provides special "Template" Pages of furnaces, quench tanks, etc. to assist you in planning—a few seconds scissor-work shows you how your department will actually look.

Material in this book is based on first hand information gained from helping in the design of hundreds of toolrooms—plus additional information gathered from the experiences of our associate, Lindberg Steel Treating Company who operate one of the world's largest toolroom heat treating set-ups.

To get your copy write to your nearest Lindberg Engineering Company office, or to the Lindberg home office at 2452 West Hubbard St., Chicago 12, Illinois.

Detailed discussions cover: Selection of Proper Size furnaces, 2000°F. Maximum—High Speed Furnaces 2500°F. Maximum—Toolroom Tempering Furnaces • Production Work Combined With Tool Heat Treatment • Tilting Hearth Furnaces • Rotary Hearth Furnaces • Furnace Brazing • Laying Out The Toolroom Heat Treating Department • Quench Tanks • Cleaning of Work • Accessory Equipment.

LINDBERG  **FURNACES**

Dear Editor:

SILVER ALLOY PASTE

Sir:

In your Newsfront of the May 22 issue, you mention "a new wrinkle in brazing carbide tool tips is a silver alloy paste that begins to melt at 480° F and is said to protect both the carbide tip and the steel joint area with a liquid protective film before the heat generated oxides can form. The new paste is merely painted on the prepared joint surfaces." Can you tell us where this silver alloy paste can be purchased?

E. W. ALLARDT
Chief Engineer
Babcock & Wilcox Tube Co.
Alliance, Ohio.

● Sherman & Co., 197 Canal St., New York 13, is the manufacturer.—Ed.

SWEDISH IRON POWDER

Sir:

In your issue of May 22, p. 59, is a discussion of a new Swedish iron powder made by Hoganas-Billesholms of Sweden. We would appreciate receiving further information about this powder.

S. A. FEIR
Assistant to the President
Roovers Bros., Inc.
Brooklyn

● A letter to the Editor of "Iron and Steel," Dorset House, Stamford St., London, S. E. 1, with any questions you may have in mind would be forwarded, we feel sure, to the originators of the material referred to in the article.—Ed.

REQUEST FROM WALES

Sir:

Could you furnish us with a reprint of an article entitled "Bridgeport Brass Opens New Rolling Mill" which appeared in the issue of Jan. 19, 1939.

N. MULLINS
Chief Buyer
John Curran Ltd.
Cardiff, Wales

ELECTRODE COATINGS

Sir:

I would like to have a copy of the article entitled "Identifying the Constituents of Welding Electrode Coatings" by R. C. Vickery which appeared in the Apr. 19, 1945, issue. Also I would appreciate your forwarding us complete information regarding the combination of the coating materials and their manufacturing process in detail. We are anxious to know what kind of mineral can be used instead of titanium dioxide which is the main constituent in some electrodes, and which is very hard to find in our country.

T. F. WAN
Engineer
2nd Aircraft Mfg. Co.
Nanchuan, Szechuan, China

● Tear sheets of the article requested have gone forward. Your second request is a difficult one since most of the formulation of welding electrodes is an art and a knack developed within individual companies and is basically their stock-in-trade. Two articles, one by Spraragen and G. E. Claussen entitled, "Coatings and Fluxes in the Welding of Steel," published in 1939, and "Spare the Rod; Spoil the Weld," which appeared in "Oilways," a publication of the Standard Oil Co. of N. J, gives considerable information on this subject. Also, "Foote Prints," published by the Foote Mineral Co. of Philadelphia may prove of value to you.—Ed.

SLUSHING OILS

Sir:

Have you published an article on slushing oils: their use and consumption in the iron and steel industry? If so, please let us know in which issue it appeared.

K. S. CHASE
Hercules Powder Co.
Wilmington, Del.

● Nothing of a comprehensive nature has recently been published on the use of slushing oils in the iron and steel industry. However, in the Oct. 22, 1942 issue, p. 56, an article, "Centralized Oil Distribution," describes the system at Union Drawn Steel Div. of Republic Steel Corp. and includes discussion of the slushing oil facilities.—Ed.

PRECISION PLATING

Sir:

Please advise if it would be possible to secure items entitled "Precision Plating of Bearing Alloys" and "A New Process for Electropolishing Silver" from the Apr. 10 issue, pp. 60 and 64.

W. H. KING
Telechron Inc.
Ashland, Mass.

STEEL SLITTERS

Sir:

I have seen advertisements of two concerns, which stated that they slit strip steel to widths as narrow as 1/32 in. and 0.060 in. respectively. Will you inform me the names of a few manufacturers of slitters that will slit 0.023 in. SAE 1010 into widths as narrow as 0.060 in.

W. C. HANLINE
271 Harvey St.
Philadelphia

● Send full particulars to the manufacturers whose names we are forwarding.—Ed.

SILICON ALLOY STEEL

Sir:

We have received an inquiry from our offices in India, for the supply of special silicon alloy steel suitable for electric motor and transformer manufacture in India. We would appreciate information as to which steel manufacturers are in this specialized field. We would prefer a medium size producer, as we feel that they may be in a better position to supply our needs . . . of 200 tons. We do appreciate the difficulties of the present position, but feel that the quantity involved may warrant some consideration.

WILLIAM NAGY
William Nagy & Co.
Wharton, N. J.

● We are forwarding a list of producers of silicon alloy steel, commonly known as electrical sheets. You are correct in your understanding that you may have considerable difficulty in securing this material because of the particularly tight market situation.—Ed.

COMPARABLE TOOL STEELS

Sir:

In your Feb. 1, 1945, issue you published a series of charts of comparable tool steels. We have been informed that reprints of these charts are available suitable for mounting and framing. We would appreciate receiving two copies to place in our tool department and heat treating department.

C. F. GUTHY
Purchasing Agent
Mercury Aircraft Inc.
Hammondsport, N. Y.

● The chart is available to readers at 15¢ a copy. Two copies have been mailed to you.—Ed.

ALUMINUM WIRE

Sir:

In your Apr. 24 issue, you mention in Newsfront that in the past year at least six companies have begun making aluminum wire for use in building construction. . . . If you could give us the names of the six companies you know of it would help us no end.

O. H. ADAMS
Dings Magnetic Separator Co.
Milwaukee

● The companies are listed in the news item, "Better Deliveries on Aluminum Products Spur New Uses," appearing on p. 97 of the same issue. Tear sheets are being forwarded.—Ed.

CRUSH FORM GRINDING

Sir:

We would appreciate receiving copies of any recent technical articles covering the subject of crush form grinding.

C. R. HARMON
District Manager
Firth Sterling Steel & Carbide Corp.
Pittsburgh

● We are forwarding tear sheets of two articles, "Production Experience Proves Economy of Crush Grinding" and "Crushed Wheel Dressing in Form Grinding" which appeared in the Aug. 29, 1946 and Feb. 15, 1945 issues, respectively.—Ed.

OXYGEN IN STEELMAKING

Sir:

We are interested in obtaining a copy of the article entitled "Oxygen in Steelmaking" which appeared on p. 47 of the Nov. 28, 1946, issue.

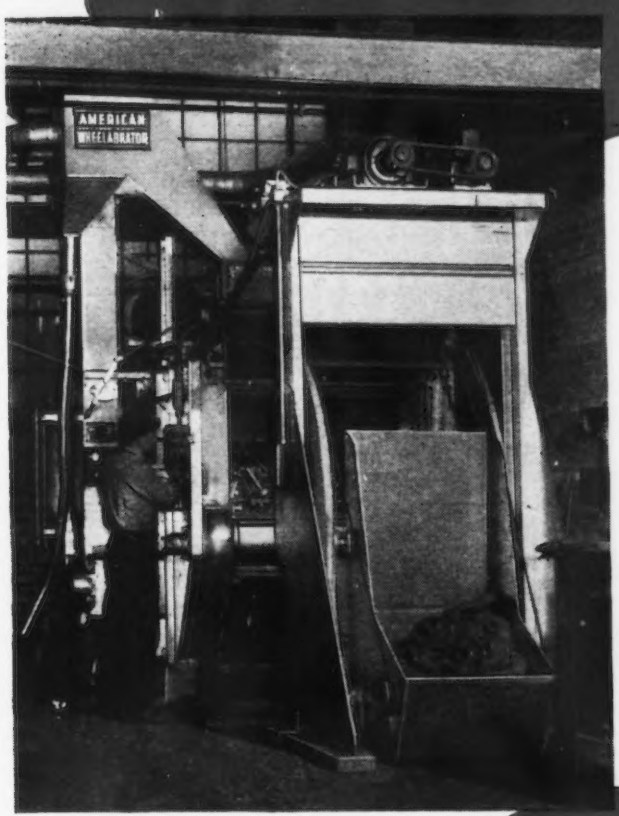
W. F. BROWN
Supt., Industrial Relations
Carnegie-Illinois Steel Corp.
Youngstown

Airless WHEELABRATOR

Cuts Cost 31% in cleaning

HEAT TREAT SCALE

at Kropp Forge Co.



Heat treat scale removal was a time consuming, costly operation with air blast equipment at the Kropp Forge Co., of Chicago, Illinois. Increased production requirements were much greater than existing equipment could handle.

American Engineers made a thorough investigation of this problem, and then recommended the installation of a 27″ x 36″ Wheelabrator Tumblast. Since this machine has been in operation, cleaning costs have been reduced 31%. These drastic savings can be directly attributed to the amazing speed with which forging scale was thoroughly removed.

In the magnafluxing department, where forgings are inspected for surface defects, time was reduced by 12%, due to the uniformly cleaned surfaces produced by the Wheelabrator.

When additional equipment was required to handle larger aircraft forgings, a 36″ x 42″ and a 48″ x 72″ Wheelabrator Tumblast were installed. These three machines clean the entire daily production of more than five tons of forgings every hour.

USED IN MODERN HEAT TREATING AND FORGING SHOPS THROUGHOUT THE WORLD

Chrysler Corp.
Chevrolet Gear & Axle Div.
Bendix Products Corp.
Warner Gear Co.
Timken Roller Bearing Co.
Plomb Tool Co.
Reed Roller Bit Company
Hyatt Bearings Div.
Burgess-Norton Manufacturing Co.
Park Drop Forge Co.
Lindberg Steel Treating Co.
L. S. Starrett Co.
Cushman Chuck Co.
Federal Drop Forge Co.
Ross Gear & Tool Co.
International Harvester Co.

Write for our latest treatise "CLEANING PROBLEMS SOLVED for Heat Treated and Forged parts". Contains complete case history data, comments from typical users, parts cleaned and a wealth of other material applicable to heat treat and forge plants.

American
WHEELABRATOR & EQUIPMENT CORP.
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
510 S. Byrkit St., Mishawaka, Indiana

D552

Industrial News Summary...

- **Coal Strike Threat Hampers Steel**
- **Outlaw Strikes Raise Scrap Price**
- **Gray Marketeers Lick Their Chops**

THERE will be no assurance that steel distribution will come into balance or that the gray market in steel can be eliminated until a definite contract has been signed between coal companies and the United Mine Workers, thus putting an end to the continual threat of a nationwide coal tieup. So many phoney angles have entered into the coal negotiation picture that no one source is able to hazard a strong opinion as to the chances of a nationwide coal strike on July 7.

However, the latest flash outlaw strikes in western Pennsylvania this week have already reduced urgently needed coal inventories, pushed up scrap market prices and injected fresh enthusiasm into gray market operators who were beginning to believe their goose was about cooked. Whether planned that way or not, the coal strikes this week hit steel company coal mines alone. Even though this so-called protest stoppage ends this week, future steelmaking has been jeopardized by the shutdowns.

Steel mills have been attempting to stock additional coal as a precaution against a strike on July 7. The 10-day vacation period starting late this month will further deplete coal supplies. This will put John L. Lewis in a strategic bargaining position—where he has always been in recent years—by using steel company captive mines as his battering ram to produce a national industrial crisis. There are those in the industry who still believe that the whole coal picture is so fraught with unusual angles that the country may escape a full-fledged coal strike.

Sensitive to current labor difficulties which might affect output of pig iron needed for steelmaking, the scrap market turned stronger this week. Advances ranging from 50¢ a ton to $3 a ton were chalked up in various districts. The biggest increase occurred in the Youngstown district where the average price of No. 1 steel was up $3.75 a gross ton. At Buffalo the average was up $2; at Chicago, $1.50; Detroit, $2.75; and Cleveland, $3. At Pittsburgh, where the stronger tone appeared first a few weeks ago, No. 1 heavy melting steel advanced 50¢ a ton.

CURRENT scrap market strength is apparently due to fear of a national coal strike which, if it occurs, would seriously reduce pig iron output for steelmaking—thus emphasis would be on more scrap in openhearth charges. Recent lower prices could not withstand the testing they have experienced, with the result that THE IRON AGE steel scrap composite price has advanced $2.50 a gross ton since May 20 when the low point for the year of $29.50 a gross ton was reached. This composite this week is up to $32 a gross ton, a hike of 83¢ a ton from last week's figure of $31.17.

The steel ingot operating rate this week was down one half a point to 97 pct of rated capacity. Output is expected to remain at a high level unless forced down by lack of coal. The decline this week was a normal fluctuation and was not attributable to any special factor.

While steel orders continued to roll into mills in heavy volume, a paradox is materializing because reports indicate that an increasing number of consumer goods manufacturers are cutting back production schedules. There is less pressure for delivery from makers of stoves, refrigerators, kitchen cabinets and similar items. Sales executives in the home offices of steel companies are aware of this strong trend in production cutbacks at manufacturing plants but insist that these consumers have not cut back on their steel orders.

Two probable reasons for the lack of cancellations of steel orders stand out. Some sources believe these customers keep taking steel to build back to normal inventories. More disquieting, however, is the view held by some that many steel consumers will continue to receive steel and attempt to sell the items not immediately needed in the gray market.

IF THE latter reason is correct, the amount of steel thrown on the gray market during the summer months may assume much larger proportions than at present. This condition would be accentuated if a coal strike should occur, thus curtailing deliveries to consumers urgently in need of every pound of steel being shipped to them. As far as humanly possible major steel companies have their eyes cocked for any semblance of redirected steel quotas. Consumers definitely caught taking more steel than they need and selling it on the gray market are having their quotas eliminated and steel shipments drastically cut or completely stopped.

Firm prices by large steel producers are being held up pending a new contract in the coal industry. One steel source has implied that if an agreement is reached without a strike his company will announce firm prices shortly. Such action has been demanded by many manufacturers in order that they may make proper plans without fear of sudden price changes. Before the war, normal practice in the steel industry was to name steel prices for a given quarter.

In the East five major machine tool builders have announced 10 pct price advances effective immediately. A number of builders in the Middle West have increased prices by varying amounts. Many of the advances have been straight across-the-board covering machines, tools and attachments.

Blast furnace silvery iron has been advanced $2 a ton. Sales of this material have expanded somewhat during the general shortage of regular pig iron.

• **STEEL WAGE ADJUSTMENTS**—Wage adjustments which have occurred in the steel industry since Jan. 1, 1947 represent an added payroll of approximately $285 million over a 12-month period, according to an estimate by the American Iron & Steel Institute. That total, which equals the net earnings of the entire industry in 1946, is computed from 1946 employment of the entire industry including nonsteelmaking activities. It is based upon uninterrupted working schedules for a full year. The basic labor rate in iron and steel plants has increased 172 pct since 1923 and 156 pct since 1933. Today that rate is $1.09 per hr for the lowest paid jobs in the industry. The net drain upon steel industry profits as a result of the wage increases approximates the amount of the increase in pay less the 38 pct that would otherwise have gone to the Federal Government in corporate federal income taxes.

• **STEEL IS CHEAP**—A late survey of the cost of building materials shows cement and structural steel are not the expensive items in building construction. Using a cost index of 100 for 1939, present material price index lines up as follows—lumber 290, paints 212, miscellaneous 157, plumbing and heating 149, brick and tile 145, cement 123, and structural steel 119.

• **FRENCH INQUIRY**—The French Technical Mission is inquiring for 15,000 tons of alloy steel bars for export. It is believed they will be successful in securing the tonnage.

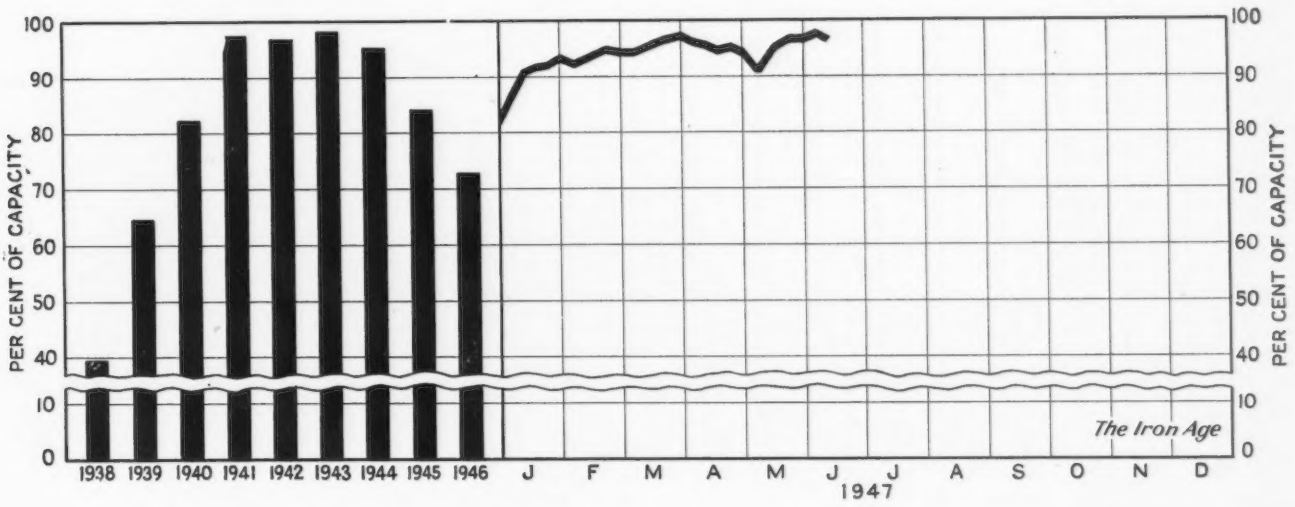
• **LOST TIME**—Largely as a result of the telephone strike, the time lost in April through labor disputes amounted to approximately 7.7 million man-days, more than double the total of 3.3 million lost during the entire first quarter, according to the Labor Dept. New work stoppages rose from 325 in March to 460 in April; including those carried over from the previous month, the total for April amounted to 625, involving more than 650,000 workers. Its Conciliation Service settled 230 cases and headed off 993 threatened strikes involving six or more workers, the department said.

• **PITTSBURGH STEEL ACQUIRES**—Pittsburgh Steel Co. of this city has acquired the Johnson Steel & Wire Co., Inc. of Worcester, Mass., a manufacturer of high carbon wire for the automobile, rubber tire, textile and musical instrument industries according to Joseph H. Carter, president of Pittsburgh Steel. The Johnson company, has a main plant in Worcester, Mass. and branch plants and warehouses at Akron, Ohio and Los Angeles, California. Its products are distributed throughout the nation and in a number of foreign countries.

• **IN ABEYANCE**—Youngstown Sheet & Tube's expansion of blast furnace, open hearth, soaking pit and blooming mill capacity at East Chicago is marking time due to high cost. This program announced recently by Frank Purnell, Youngstown's president, is designed to enlarge the ingot supply to match the capacity of the finishing mills at the Indiana Harbor plant. A spokesman for the company said that the present costs are so much higher than those estimated, that the entire project will have to be delayed for some time.

• **STEEL OUTPUT RECORD**—A new peacetime record in steel production was set in May when the nation's steel furnaces turned out 7,332,828 net tons of steel ingots and steel for castings, according to the American Iron & Steel Institute. This brought total steel production for the first 5 months of this year up to 35,318,435 net tons, almost 14 million tons more than was turned out during the first 5 months of 1946 when strikes in the steel industry and the coal mines held production down to 21,708,148 net tons. Of the May total, openhearth production represented 6,633,203 net tons, equivalent to a 96.4 pct rate of operation of these furnaces; bessemer furnaces, operating at 85.1 pct of capacity, accounted for 372,823 net tons; and electric furnaces produced 326,802 net tons, averaging 75.8 pct of capacity. The combined rate of all facilities for May averaged 94.6 pct of capacity, as compared with 93.8 pct in April, and 52.2 pct in May 1946.

Steel Ingot Production by Districts and Per Cent of Capacity



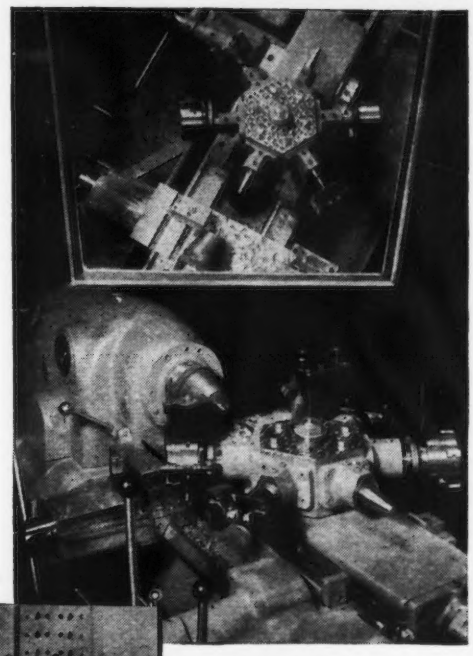
Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
June 3.....	105.0	96.0	92.5*	94.5	98.5*	102.0	100.0	99.0	100.5*	105.0	98.0	82.0	108.0	97.5
June 10.....	105.0	95.0	92.0	94.5	96.0	102.0	100.0	99.0	100.5	105.0	101.0	82.0	108.0	97.0

* Revised.

FINISHED LOCK-SCREWS—

One Every 31.2 Seconds

Part—Lock Screw; Material—Brass, 3/8" Bar Stock; Preselected Spindle Speeds—4; Hex Turret tooled for duplicate cycle; Time per piece—31.2 seconds; Setup time—32 minutes.



Will your present hand screw machine make four cuts—a forming cut, then thread, knurl and cut off—involving spindle speeds as low as 800 rpm and as high as 3,000 rpm—all in only a little more than half a minute?

That's Speedi-Matic production! And that's why this completely electronically controlled Monarch lathe is becoming recognized as "The World's Fastest Hand Screw Machine". On lots of 25 to 500 or more it combines maximum production with extreme accuracy. For complete details ask for bulletin 1901.

FOR PEAK PRODUCTION AT A *PROFIT*
SPECIFY SPEEDI-MATIC

Here's what you get:

- **Automatic electronic speed change, preselected for as many as ten stations.**
- **Complete range of spindle speeds—50 to 5,000 rpm.**
- **Feeds from .0005" to .016" per revolution.**
- **Hand or power feed ram-type turret.**
- **Quick-acting spring-return, hand-operated cut-off slide.**
- **Air-fed pusher-type collet attachment.**
- **Collet chuck capacity—7/8".**

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

MONARCH MACHINE TOOL CO. • • • Sidney, Ohio

See Fair Prospects for 10,000 Freight Cars Monthly by Fall

New York

• • • **Freight car production** is about 50 pct below schedule but many qualified observers believe the 10,000 car a month goal set for July will be reached this fall. At the moment the picture is clouded by countless charges and counter-charges. Most of the interested parties—the carbuilders excepted—are blaming each other for the poor showing. The carbuilders are saying absolutely nothing. But when the dust settles it will probably be clear that no single group should shoulder the blame. Unbalanced inventories will, it is believed, be the No. 1 villain.

Like most of the shortages facing industry today, the trouble started during the war. The War Production Board refused to give freight car building top priority and the car shortage that hampered the war effort has been multiplied by obsolescence to the point where it threatens the worst transportation crisis in American history.

Early this year two task committees were set up in Washington to plan for higher output. One represented the steel industry, the other the freight car builders. Following their deliberations Sen. Clyde A. Reed, R., Kan., announced on Feb. 26 that the steel industry had voluntarily agreed to supply steel, beginning in June, for 10,000 cars a month. He also stated at that time that he was so happy he almost kissed a U. S. Steel Corp. vice-president.

These conferees, Washington sources say, agreed on overall tonnages of general products—plates, sheets, shapes, etc.—but not on specific sizes and specifications. That is, actual bills of materials were not submitted to steel and parts suppliers at that time.

This year's production has been low, as the following figures on cars built both by railroads and car builders show: (Source: American Railway Car Institute).

January	2984
February	2293
March	2883
April	4123

Other sources estimate production in the first half of May at 1797 cars. The backlog of orders on hand in car company and in railroad shops on May 1 was 99,346, according to the car institute.

Unbalanced Inventories Are Called Main Reason For Present Low Output

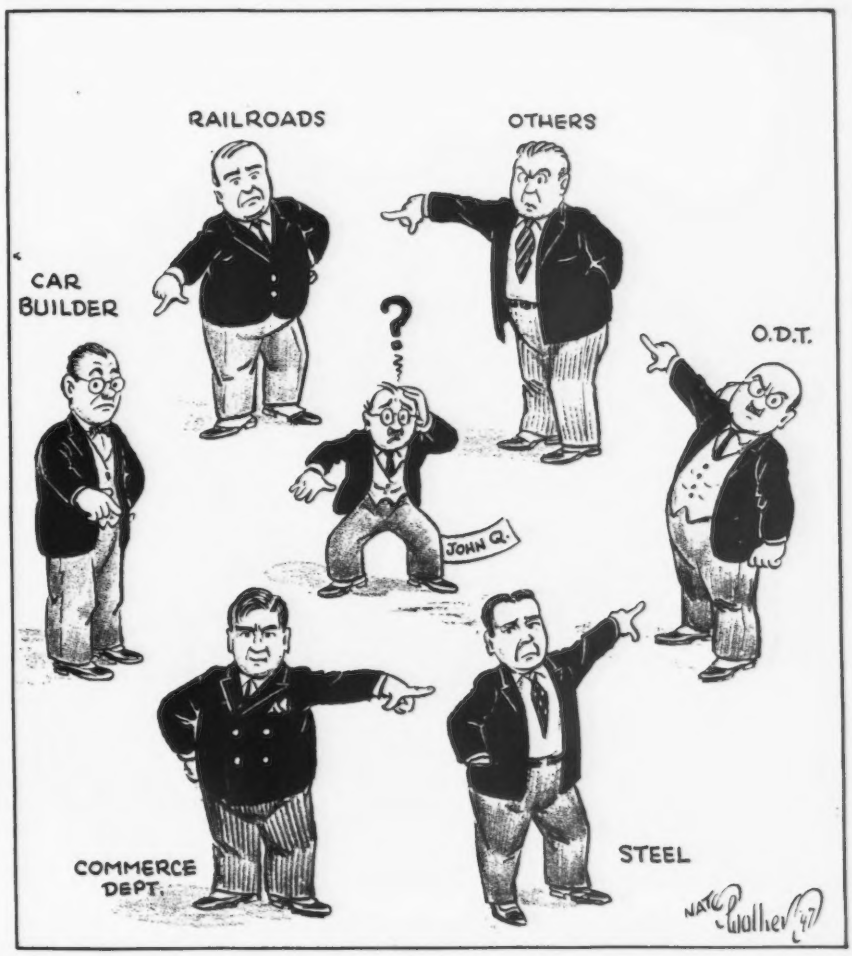
o o o

This poor showing has caused almost everyone concerned to accuse almost everyone else involved of falling down on the job. Col. J. Monroe Johnson, Director of the Office of Defense Transportation, declared the steel industry was living up to its part of the bargain. A Commerce Dept. official blames the railroads. Attorney Gen. Clark has authorized a grand jury investigation into alleged restraints of trade and anti-trust law violations on the part of some car builders.

Individually, the car builders blame no one. Officials of both Pullman-Standard Car Mfg. Co. and American Car & Foundry Co. refuse to comment for publication. It is believed that Attorney General Clark's anti-trust action is responsible for the silence of the carbuilders.

Colonel Johnson on May 29 said that the ODT's steel industry advisory committee had reported to him that during March 202,000 tons of steel were shipped and in April the figure was 206,000 tons —all of the various types required for freight car production. The colonel said further that discussions with car builders had failed to produce an entirely satisfactory

"Who is to blame for the freight car shortage?"



explanation for the "disappointing" low production for the first half of May. Later, an ODT spokesman told THE IRON AGE that while that office was reluctant to attempt to fix blame for production failure, a portion of it might lie in unbalanced inventories—not for the carbuilding industry as a whole but with the individual companies. Wheels and brake shoes, ODT said, are in adequate supply.

Colonel Johnson's statement was answered by S. M. Felton, president, American Railway Car Institute, with the comment that the carbuilders were obviously in business to build cars. "It is not the total tonnage of steel that is all important but having the complete car sets of all materials available to the shops at the proper time. The carbuilders in this respect are being plagued by the same basic problem as are many other industries," he asserted.

At press time the carbuilders had not commented on Attorney General Clark's anti-trust charges. It is understood that they were not in possession of sufficient details on the Government's position to make a reply. Assistant Attorney General John F. Sonnett asserted, in elaborating on Mr. Clark's assertions, that the Justice Dept. recognized "that the current low rate of production is due in part to the steel shortage and to factors other than the trade restraints indicated by the preliminary investigation of the industry."

The steel producers have had little to say for publication about the carbuilders, who are among their best customers. Privately, however, some criticism about methods is heard. The car manufacturers have readopted their prewar policy of coming to mills with a complete bill of materials for a specified number of cars. But because mill rolling schedules are set up on a cyclical basis depending principally upon demand for the product, the completion of shipment of an entire bill of materials will be spread over a long period.

Some items, steel mill officials explained, have frequent rolling cycles and delivery is prompt. Other items are on extended rolling cycles of up to 8 to 12 weeks, and the material may not even be scheduled for rolling for another month or more. Lack of standardization of orders by the railroads came out as another cause of steel delay, though this variation is principally in the specialties, draft gear and similar accessories.

One suggestion for easing the problem involves return to the wartime system practiced by WPB. If a central clearing house for carbuilders handled ordering it could apportion substantial tonnages of structurals, plates sheets and other items so that each mill would get a sizable run of a specific product in a given size. The result, it is said, would be longer mill runs with less down time and greater output per man-hour.

One car manufacturing company is putting emphasis on a standard, or "packaged" car—a one-design product to meet the average box car requirements of any railroad in the country. The idea has been widely praised but some observers feel it comes at the wrong time. The reason is that this company formerly bought fabricated ends and roofs for all of its freight cars from another supplier.

This other supplier still gets its quota of sheet steel for these ends and roofs but the car manufacturing company is now manufacturing ends and roofs for the "packaged" car from its own steel. The car builder isn't covered for this steel in its quota and the supplier won't divert it because it can sell the ends and roofs to other car and railroad shops. The result is a cut in one manufacturer's car production possibilities.

An increasing tendency to push passenger car construction is cited as another slight deterrent to freight car building. This may not be the carbuilders' fault as there are good indications that many railroads want it this way.

L. L. Horch, New York regional director, Dept. of Commerce, laid the present plight to failure of the railroads to place volume orders at the end of the war. Such charges have in the past been countered by railroad men with the assertion that the rail revenue picture precluded their ordering in volume in the past.

Meanwhile steel officials assert that they are meeting carbuilders' steel commitments. Specifically, Carnegie-Illinois says it has met its commitments for the program for both March and April and Inland reports it is a little ahead.

Railroad car shops surveyed indicate few steel or parts supply difficulties. K. F. Nystrom, chief

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VAMPIRE? *Steel also goes into passenger cars since roads are finding that new passenger equipment pays. Here, in a Pullman-Standard Car Mfg. shop two workers are testing for window sill leakage with a hose.*

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mechanical officer of the Milwaukee Railroad, told THE IRON AGE his freight car building program was on time and was not being held up for the lack of steel. This road, which has long been planning a fleet of new passenger trains, will begin construction of six, 10-car passenger trains about July 1.

R. D. Long, director of purchases of the Burlington road, informed THE IRON AGE that their car building shops are going at full capacity. Mr. Long reported that production has only slightly been held up because of material shortages and the supplies in the last 3 weeks have become much better. This shop builds 18 to 20 cars a day and is working on a 2000-box car schedule right now. It will start construction on 1000 hopper cars later.

Sheets are the tightest single item. Sheets were not claimed to be the cause of any shutdown on car building lines as yet, but their shortage is said to impede several producers. All manufacturers name sheets as the cause of headaches and one car equipment maker told THE IRON AGE that the third quarter production of car components was going to suffer badly if his plant cannot find additional sources of sheet supply. Although the mills have fully met their commitments to this company, the demand for freight car components will necessitate more sheets in the third quarter.

Competent observers in the Midwest disagree with some Eastern sources and doubt if the 10,000 units per month production can be fully met before December. Some firmly believe that it will never materialize due to component part shortages, labor scarcity and the fact that passenger car production is also badly needed and is also being increased. Others say that with steel and iron parts being shipped in their current volume the unbalanced inventories now causing much of the delays should be fairly well ironed out by September.

In Brief—

New York

• • • Carbuilders either don't know or won't say what specific items they lack, and in what tonnages. The American Railway Car Institute doesn't know either but is making a survey to find out. While sheets are most often mentioned in talk of shortages all evidence indicates that unbalanced inventories are responsible for low freight car output.

Steel is apparently being shipped in sufficient quantity to even up builders' inventories in a matter of months. It is therefore predicted that June production will be about 6000 cars; July, 7000; August, 8000; and September, 10,000.

Cars are wearing out at the rate of 6000 a month. In the face of a tremendous demand for rolling stock to move crops, steel, ore and thousands of other products, all sources agree car supply will be critical for years to come. Meanwhile shippers are being reminded that they can make a substantial contribution by increasing their efforts to reduce car turn-around time.

Strike Costs 450 Cars

Bessemer, Ala.

• • • A 2-weeks' strike at the Bessemer plant of Pullman-Standard Car Mfg. Co. ended June 6 after production on approximately 450 freight cars was lost.

The new contract with the United Steelworkers of America, CIO, provides an hourly wage increase of 15½¢, some adjustments in what the union contended were wage inequities, and vacation changes.

About 1400 men are employed at the plant.

Cites Need for Smelter

Washington

• • • Due to the acute world shortage of tin continued operation of the government-owned tin smelter at Texas City, Tex., is necessary until at least June 30, 1949, according to Morris Levinson, executive director, Office of Metals Reserve. Testifying before a Senate Banking and Currency Subcommittee which is considering legislation to continue this operation, Mr. Levinson pointed out that it is the only tin smelter in the Western Hemisphere and that it is necessary for peacetime needs as well as a vital source of tin in the event of another emergency.

Blast Furnace Capacity and Production—Net Tons

	Number of Companies	Annual Blast Furnace Capacity	PRODUCTION							
			PIG IRON		FERRO-MANGANESE AND SPIEGEL		TOTAL			
									Pct of Capacity	
			April	Year to Date	April	Year to Date	April	Year to Date	April	Year to Date
DISTRIBUTION BY DISTRICTS:										
Eastern	11	12,551,280	890,924	3,615,014	25,246	101,853	916,170	3,716,867	88.7	90.0
Pittsburgh-Youngstown	16	25,042,040	1,859,123	7,628,787	9,327	58,192	1,868,450	7,686,979	90.7	93.3
Cleveland-Detroit	6	6,557,500	500,417	2,008,508	.....	.....	500,417	2,008,508	92.7	93.1
Chicago	7	14,097,710	1,036,706	4,133,838	.....	.....	1,036,706	4,133,838	89.4	89.1
Southern	8	4,924,670	319,023	1,288,983	8,764	36,625	327,787	1,325,608	80.9	81.8
Western	4	2,536,000	177,849	709,720	2,338	7,868	180,187	717,588	86.4	86.0
Total	36	65,709,200	4,784,042	19,384,850	45,675	204,538	4,829,717	19,589,388	89.3	90.6

Source: American Iron & Steel Institute

Steel Firm Cracks Down on Its Over-Quota Customers

Users Found Selling Unneeded Quotas of Steel Being Cut Off From Order Books

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Washington

• • • **Customers of** Inland Steel Co. who are definitely shown to be selling unneeded quotas of steel in the gray market are being cut off the books immediately and their quotas redistributed according to J. L. Block, vice president in charge of sales of the firm. His statement, with that of A. J. Hazlett, sales vice president of Jones & Laughlin Steel Corp. marked the first appearance of officials of the major steel companies before the Senate Small Business subcommittee which is investigating the steel gray market.

The questioning of the steel officials followed the line forecast by THE IRON AGE—What can and will the industry do to help stamp out the gray market? The steel officials admitted frankly that there is little that the steel companies can do in the way of policing once the shipment has left their possession.

Inland was the first to be called somewhat in advance of schedule, as a result of the firm name having appeared on some steel packaged for export but sold at marked-up prices.

This latter steel, Mr. Block revealed, had been part of a consignment of ingots, furnished by the David L. Willkoff Co., rolled into sheet by Inland on contract in order to utilize excess rolling capacity. The company now refuses such contracts except with fabricators who can show they need the sheet for their own operations.

Mr. Hazlett appeared to answer complaints that J&L had pulled out of certain market areas. Such belief is unfounded according to Mr. Hazlett. He stated that J&L has not withdrawn from any market area except in specific types of production which it is not economically feasible to ship into certain areas.

He also denied a charge that J&L was confining shipment of drum steel to its own subsidiaries, a statement supported later by H. E. Robinson, a firm sales manager.

The steel officials were united in the opinion that the supply and demand will be in better balance before the year is out and that the gray market, already indicated as on the decline, partly as a result of publicity, will disappear over the next few months as steel demand is satisfied. Uninterrupted employment and full production is the best way to improve the situation, they agreed.

"J&L expects to maintain a consistently high level of production barring losses which might occur as a result of strikes or mechanical failures. It will be our policy to continue to distribute this tonnage as equitably as possible."

Strikes last year, he added, cost J&L approximately 700,000 tons of finished products of which 400,000 tons represented flat rolled steel. Mr. Block said Inland's loss from the same causes amounted to about 600,000 tons of ingot steel.

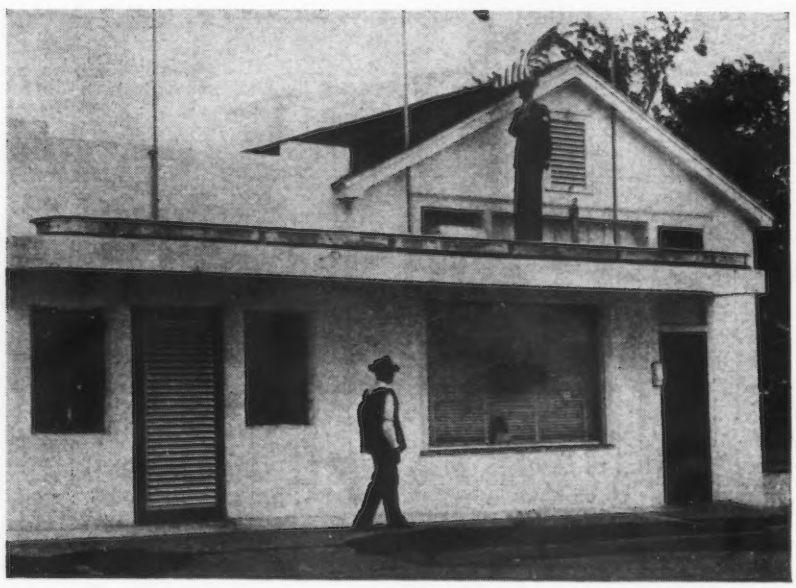
"Some semi-finished steel can usually be obtained by buyers from sources which do not themselves have adequate finishing facilities," Block said in reference to conversion arrangements, some of which have provided sheets for the gray market. "Inasmuch as our company has excess rolling capacity for hot rolled sheets and certain other products, we have entered into some of these arrangements. During recent months we have produced 25,000 to 35,000 tons a month, of which 80 to 90 pct was sheet, from steel supplied from outside sources."

"When these arrangements began last year," he added, "our policy was to accept business from any purchaser who was financially responsible. . . . However, as time progressed and certain developments took place, we amended our original policy to the extent that . . . we confine our conversion arrangements solely to manufacturing consumers, essentially firms with whom we have had a long established relationship."

Reaffirming his belief that the gray market is not as extensive as reported, Mr. Hazlett concurred in the policy and belief of his company that "in any amount, such exploitation of the current shortage is harmful to the industry, its customers, and the national economy."

Such gray market sources as have been tracked down have been found to lie: in consumer steel where quotas with the mills have

BUILT-IN PICKET: *After 13 months of picketing had begun to wear on the sidewalk and the nerves of the owner of this Tulsa, Okla., bakery he decided on an automatic picket. The character patrolling the track on the special balcony is the result. The union has spurned the baker's offer to rent "Unfair" space on the automaton's back—its human picket still pounds the baker's sidewalk.*



L. W. Moffett Dies

• • • Leon Wesley Moffett, veteran newspaperman and Washington Bureau Chief for THE IRON AGE and the Chilton Co., died suddenly at his home on June 4 at the age of 64.

"Moff", as he was known about Washington and to his associates, became the Washington correspondent for THE IRON AGE in 1921. Later he became bureau chief for all the Chilton publications.

He had been a newspaperman nearly 50 years and had worked in Denver, Des Moines and Pittsburgh before going to Washington.

Mr. Moffett also was one of the original members of the White House Correspondent's Assn. and was accredited to the Senate and House press galleries. He was widely known and respected by members of the steel industry for his careful and interpretive reporting as well as among the Washington press corps. He numbered many notables among his friends and acquaintances, including ex-President Hoover, present and past cabinet members.

He had been a member of the National Press Club since December 1915 and at one time served as an officer of the organization.

been in excess of needs; in sheet rolled under contract from ingots furnished by the contractor; in some redirected export tonnage; and, in sales made by some steel consumers to get rid of unbalanced or obsolete inventories.

Lending confusion to the whole situation is the fact that a great deal of the gray market consists of verbal deals by which more or less unidentified persons contract to peddle mythical steel which they hope they may obtain in the future. Further evidence of these fake operations was furnished the subcommittee by the Bethlehem Steel Co., which revealed that following a theft of stationery from the firm's Philadelphia office earlier in the year, spurious confirmations of steel orders have been showing up on company letterheads.

The subcommittee has ended the first phase of the hearings and recessed temporarily while it digs deeper into the subject and charts its future course. THE IRON AGE was told by a staff member that the group will attempt to ascertain how many small firms are buying on the gray market and the total tonnage involved, what relationship, if any, exists between forced closings and the gray market, and, future steel needs in relation to existing capacity of the industry (see THE IRON AGE, June 5, p. 96). In the meantime, George F. Meredith, staff executive director, expected to leave for the West Coast to look further into the situation there.

Foley Nominated For President of ASM

Cleveland

• • • **Francis B. Foley,** superintendent of research, the Midvale Co., Philadelphia, has been nominated for the presidency of the American Society for Metals, according to an announcement by W. H. Eisenman, national secretary of ASM.

Dr. H. K. Work, in charge of research and development for Jones & Laughlin Steel Corp., Pittsburgh, has been nominated for vice-president.

Frank L. Spanigel, engineer, industrial division of Rochester Gas & Electric Corp., has been nominated for treasurer of the society.

Dr. E. G. Mahin, head of the department of metallurgy, Notre Dame University, and C. M. Carmichael, vice-president, Shawinigan Chemicals, Ltd., stainless steel and alloys division, Montreal, Canada, have been nominated for trustees.

Empire Steel Head Quits

Mansfield, Ohio

• • • **Joseph B. Montgomery, Jr.,** president and chairman of the Board, Empire Steel Corp., has resigned because of what he said were "differences among the board of directors regarding company policies."

After a 7-hr session of the board of directors, Mr. Montgomery made the following statement, "I have and always will uphold policies I consider good for the stockholders and employees, but I cannot support any policy to the contrary."

Mr. Montgomery had been president of Empire Steel Corp. for 10 years. About 6 weeks ago, William J. Mericka and Charles J. Smith, of Cleveland, and Lewis J. Thomas, Philadelphia, were elected directors.

Canadian Output Of Ingots, Castings Down

Toronto

• • • **Production of** steel ingots and castings in Canada for April amounted to 252,156 net tons, or 86.5 pct of total rated capacity and compares with 269,732 tons in March when the average was 89.5 pct of capacity, and with 247,519 tons produced in April 1946.

For the 4 months ending with April, production of steel ingots and castings totalled 1,000,908 net tons, as compared with 975,152 tons in the same period of 1946 and 1,070,860 tons in 1945.

Following are comparative monthly production figures for 1947 in net tons:

1947	Steel Ingots	Steel Castings
January	243,557	6,241
February	223,124	6,098
March	263,193	6,539
April	244,998	7,159
Total 4 months	974,872	26,036

Cost Reduction Main Theme at Gear Makers' Convention

Hot Springs, Va.

• • • **New national officers** of the American Gear Manufacturers Assn. elected for 1947-48 at the association's 31st annual meeting were: President R. B. Tripp, executive vice-president, Ohio Forge & Machine Corp.; vice-president, W. L. Schneider, vice-president Falk Corp.; treasurer F. W. Walker vice-president Philadelphia Gear Works, Inc. Four new members of the executive committee were also elected. These were Leroy Brooks, Tool Steel Gear & Pinion Co.; Brad Foote Jr., Brad Foote Gear Works, Inc.; J. E. Mullen, National Erie Corp., and R. B. Salinger, Massachusetts Gear & Tool Co.

R. B. Tripp

An outstanding feature of the convention was the open commercial forum at which questions were answered by a board of experts consisting of F. W. Walker, Leroy Brooks, George Hodge, International Harvester Co., J. E. Mullen, R. B. Salinger, and W. L. Schneider. AGMA president T. J. Bannan, Western Gear Works, acted as moderator.

Subjects discussed included the standardization of gear patterns and coded identification of patterns, the advisability of allowing cash discounts, the necessity for maintaining a proper balance between production and inventory, and ways and means of instilling cost consciousness in employees. Also discussed were the price trends in the gear industry, labor relations, incentives and profit sharing plans, productivity, and the problem of meeting quoted prices at the time of delivery.

Two technical papers were delivered during the convention. The first of these was "Cemented Hard Carbide and Gear Making" by Philip M. McKenna, president Kennametal Inc.

After describing briefly the technique of manufacturing cemented hard carbide materials, and giving a number of practical examples of the economies effected by machining gears with carbide tools, Mr. McKenna has predicted that on the basis of the known properties of cemented carbide and its behavior in rubbing against steel, very high gear ratios may be accomplished by the use of carbide for the small gear and steel for the large gear. Suppose, he said, the large gear of steel were 200 times the diameter of the small carbide gear, the object being to effect a very high speed ratio in a single pair of gears. It has been found that in lathe centers and other instances where steel wears against carbide, that the carbide lasts about 200 times as long as a steel center. Thus the two gears would last about equally since one part is as durable as the other. It should be quite feasible to grind and lap carbide gears accurately, first molding them as accurately as possible in the state before shrinking. Who knows, Mr. McKenna said, but that some equipment or device awaits but the provision of this combination to make practical a device which was heretofore not feasible because of the requirements of space or weight not permitting the use of a train of gears? Possibly some gears are required to work in sand and water, or in dusty air, so that their life is too short. I believe, he declared, that it is reasonable to extend that life 100 to 200 fold.

New Association Officers Elected—R. B. Tripp Named President

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"Reducing Cost in Manufacturing Transmission Gears," the second technical paper, was delivered by Harold J. Inch, Jr., research department, Engineering Division, Ford Motor Co. With the average transmission design in use today, Mr. Inch said, a major cost reduction program cannot be initiated entirely by the production or manufacturing departments, but will usually require a redesign. The changes required involve definite features to be added to forging and part design.

To prepare a cost reduction program in manufacturing transmission gears, the following things must be done: (1) Utilize the material to better advantage; (2) produce uniformity of forged fibre structure; (3) provide simplified locating points; (4) eliminate secondary handling; (5) provide satisfactory quality control. It is to be conceded that forgings for gear blanks are more desirable from the distortion and wear life standpoints than are blanks from bar stock, but one of the first requirements of forgings is that they have uniformity of fibre structure. The use of hot pierced forgings has the double advantage of providing uniform distribution of fibre structure and the saving of material equal to the volume of metal displaced from the hole.

One of the most important features of cost saving is the elimination of secondary handling operations. This also requires that the following features be included in the design of the part: (1) Gear forgings with pierced holes can be broached direct without previous machining. (2) Providing centers located from the broached hole, from which all locating for machining is done, furnishes a simple locating point which does not need correction for subsequent operations. These centers should include a protective counterbore to insure against deformation. (3) Providing centers also eliminates machining operations to locate parts which later are of no functional value. Even after heat treatment, this center distorts the least of all dimensional diameters. The locating error caused by distortion of the hole in heat treating is less when locating on centers than when an arbor is used.

Hopes of 80 Million-Ton Ore Movement Dimmed by Coal Threat

Cleveland

• • • **Last chance for** an 80 million-ton iron ore movement on the Great Lakes this season lies in a strike-less settlement of the coal crisis, according to reliable sources in the iron ore trade here.

In the event of a coal strike of long duration, the Great Lakes bulk cargo fleet would be tied up within 30 days for lack of fuel and the movement of iron ore would be brought to an abrupt halt, observers pointed out.

Since the government's contract with the coal miners expires July 1, when the mines are returned to private owners, a coal strike on that date or shortly thereafter would probably halt the movement of iron ore at approximately the mid-point of the navigation season.

Owing to the status of soft coal contract talks, some sources here predicted that the 1947 season movement will not exceed 65 million tons, which would be about 15 million tons under the iron and steel industry's requirements, based on the present rate of consumption.

Sinking of the Canadian lakes freighter Emperor in Lake Superior at the upper end of Isle Royal dims possibilities of an 80 million-ton iron ore movement still further. On June 4, the Emperor, outbound with iron ore loaded at Port Arthur for delivery at Ashtabula struck Canoe Rock at the tip of Isle Royal, costing the lives of 10 persons.

Plagued by ice conditions, which delayed the opening of navigation, and fog ever since, the iron ore trade can ill afford loss of the Emperor at this time. Fleet capacity at the opening of navigation was thought to be the only limiting factor in the iron ore movement this season, and loss of the Emperor, owned by Canada Steamship Lines, Inc., means a decrease in capacity which cannot be made up, according to qualified observers.

The Emperor was not the first iron ore carrier to strike Canoe Rock. In 1918 the steamer Congdon, also loaded with iron ore, struck Canoe Rock, broke in two, and sank.

Prolonged Coal Strike Would Halt Great Lakes Fleet Within 30 Days

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By W. A. LLOYD
Cleveland Regional Editor

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Barring interruption of the iron ore movement, July 15 or thereabouts will mark another historic event in the saga of the Mesabi Range, when the total iron ore output reaches 1.5 billion tons. First iron ore from the Mesabi reached Cleveland 55 years ago this November, and at the end of the 1946 season, a total of 1,482 million tons had been brought down the lakes from the Mesabi range.

However, shipments of Lake Superior iron ore from upper lake ports in May were 10,372,853 gross tons, representing a very large increase over the 3,616,115 gross tons shipped in May 1946, according to report of the Lake Superior Iron Ore Assn. Seasonal shipments to June 1, the association reported, were 14,821,264 gross tons, an increase of about 241 pct over the season to June 1 last year.

May shipments have been very gratifying to the iron ore trade and some observers feel that movement at this level for the balance of the season will assure the consumers of an adequate supply. In any event, in the past the iron ore trade has always brought down enough.

American Great Lakes Ore Vessels
May 15, 1947
(Based on 20 ft draft)

	Trip Capacity	Tonnage in Commission	Number Boats	Number in Commission	Number in Ore Trade
Pittsburgh Steamship Co.	696,350	696,350	62	62	62
Interlake Steamship Co.	364,900	364,900	36	36	36
Hutchinson & Co.	288,950	288,950	33	33	33
Cleveland Cliffs Iron Co.	165,500	165,500	17	17	17
Cleveland Cliffs Iron Co. (USWSA)	30,100	30,100	5	5	5
Great Lakes Steamship Co.	139,700	139,700	15	15	15
M. A. Hanna Co.	139,100	129,800	13	12	12
Bethlehem Steamship Co.	126,900	126,900	12	12	12
Wilson Transit Co.	117,100	117,100	12	12	9
Columbia Transportation Co.	88,900	88,900	10	10	10
Reiss Steamship Co.	85,700	85,700	9	9	9
Tomlinson Fleet	79,300	79,300	8	8	7
Midland Steamship Co.	59,900	59,900	7	7	7
Boland & Cornelius	45,300	37,300	5	4	4
Interstate Steamship Co.	43,000	43,000	4	4	4
Kinsman Transit Co.	39,100	39,100	5	5	4
Browning Steamship Co.	37,200	30,800	6	5	4
Shenango Furnace Co.	36,000	36,000	3	3	3
Ford Motor Co.	23,750	23,750	2	2	2
International Harvester Co.	22,300	22,300	2	2	2
Brown & Co.	21,400	21,400	3	3	1
Gartland Steamship Co.	17,100	17,100	2	2	1
Schneider Transportation Co.	11,800	11,800	2	2	1
	2,679,350	2,655,650	273	270	260

Block Says Inland's Sheet Capacity Will Be Up 25 Pct in '48

Washington

• • • **Inland Steel Co.'s** cold-rolled sheet capacity will have been increased by about 60 pct or 300,000 tons within the next year, J. L. Block, executive vice-president in charge of sales, told the Senate subcommittee investigating steel shortages and gray markets.

This increased capacity will be a result of Inland's $18 million expansion program now underway and which is expected to reach completion by the end of the second quarter 1948, barring unforeseen stoppages in production and construction.

While Inland's new sheet capacity will be largely cold-rolled, it will have the effect of increasing the firm's overall sheet capacity by 20 to 25 pct.

In the meantime, he declared, all attempts possible had been made to step up total sheet production since it is a short material. As a result of Inland's total production during the first quarter of 1947, 45 pct of the tonnage was sheets as compared with 36 pct during the prewar years of 1939-40. He went on to emphatically deny that the mills have accelerated cold-rolled sheet production to the detriment of hot-rolled output.

"Uninformed sources have contended that hot-rolled sheet production has been curtailed because of price considerations," he said. "Of our total sheet production in the first quarter of 1947, Inland's records indicate that 57 pct was of the hot-rolled grade as compared with a percentage of only 52 during the prewar years of 1939-40."

While general steel capacity expanded during the war, he explained, sheet capacity actually contracted. Now war postponed needs and new uses have resulted in an abnormal scarcity. When supply and demand will balance is pure conjecture, he said.

He added, "In my opinion, the present unprecedented shortage of sheet should be completely eliminated by the time new facilities now underway throughout the industry are completed during the year 1948—unless there are further interferences with production and construction."

AMERICAN IRON AND STEEL INSTITUTE
SHIPMENTS OF STEEL PRODUCTS
ALL GRADES INCLUDING ALLOY AND STAINLESS
(Net Tons)

APRIL - 1947 (Month)

Steel Products	Number of companies	Items	Current Month: Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale) (Net Tons)	Current Month: Per cent of Total Shipments	Current Month: Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale (Net Tons)	To Date This Year: Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale) (Net Tons)	To Date This Year: Per cent of Total Shipments	To Date This Year: Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale (Net Tons)	Whole Year 1946: Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products For Resale) (Net Tons)	Whole Year 1946: Per cent of Total Shipments	Whole Year 1946: Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale (Net Tons)
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	40	1	230,849	4.2	179,319	863,401	4.2	703,956	1,949,624	4.0	1,645,748
Structural shapes (heavy)	13	2	392,032	7.2	96	1,477,423	7.2	1,075	3,474,284	7.1	5,399
Steel piling	3	3	27,316	0.5	-	107,738	0.5	23	205,313	0.4	141
Plates (sheared and universal)	29	4	554,551	10.2	18,374	1,993,215	9.8	76,077	4,158,181	8.5	250,709
Skelp	5	5	13,650	0.2	33,793	58,391	0.3	128,514	227,033	0.5	194,666
Rails—Standard (over 60 lbs.)	4	6	190,431	3.5	100	745,807	3.6	255	1,790,311	3.7	4,890
—All other	5	7	15,106	0.3	182	58,308	0.3	206	144,999	0.3	426
Joint bars	7	8	16,171	0.3	1,206	63,848	0.3	4,607	176,803	0.4	5,327
Tie plates	8	9	46,459	0.9	265	160,942	0.8	2,359	447,496	0.9	18,700
Track spikes	8	10	16,977	0.3	23	60,618	0.3	54	146,194	0.3	693
Hot Rolled Bars—Carbon	33	11	549,093	10.1	66,698	*2,104,291	10.3	263,547	5,006,859	10.3	707,991
—Reinforcing—New billet	16	12	113,593	2.1	594	* 410,696	2.0	3,033	1,048,483	2.1	7,381
—Rerolled	11	13	14,175	0.3	-	46,551	0.2	-	141,346	0.3	1,267
—Alloy	26	14	150,157	2.7	17,338	* 596,815	2.9	73,305	1,390,278	2.8	138,395
—Total	44	15	827,018	15.2	84,630	3,158,353	15.4	339,885	7,586,966	15.5	855,034
Cold Finished Bars—Carbon	29	16	136,399	2.5	1,207	541,614	2.7	2,616	1,316,579	2.7	2,428
—Alloy	25	17	22,053	0.4	206	89,421	0.4	574	196,237	0.4	1,725
—Total	35	18	158,452	2.9	1,413	631,035	3.1	3,190	1,512,816	3.1	4,153
Tool steel bars	19	19	8,923	0.2	551	33,273	0.2	1,731	96,020	0.2	371
Pipe & Tubes—Butt weld	15	20	151,860	2.8	5,428	529,020	2.6	20,574	1,276,289	2.6	45,393
—Lap weld	8	21	34,415	0.6	33	133,663	0.7	556	305,516	0.6	238
—Electric weld	10	22	82,947	1.5	522	305,887	1.5	* 2,762	674,459	1.4	591
—Seamless	11	23	184,748	3.4	11,865	697,143	3.4	50,004	1,871,540	3.8	83,441
—Conduit	7	24	12,730	0.2	993	42,128	0.2	* 3,861	98,521	0.2	2,448
—Mechanical and pressure tubing	12	25	51,788	0.9	1,511	208,438	1.0	6,065	429,180	0.9	3,478
Wire rods	22	26	59,755	1.1	30,652	* 207,780	1.0	* 111,027	679,998	1.4	346,506
Wire—Drawn	38	27	218,039	4.0	18,206	* 852,157	4.2	68,358	1,933,124	4.0	135,592
—Nails and staples	18	28	74,324	1.4	989	294,382	1.4	2,383	636,632	1.3	797
—Barbed and twisted	14	29	24,366	0.4	-	80,699	0.4	8	207,610	0.4	-
—Woven wire fence	13	30	38,295	0.7	395	137,940	0.7	1,322	383,230	0.8	-
—Bale ties	12	31	10,308	0.2	-	40,322	0.2	-	99,993	0.2	-
Black Plate—Ordinary	9	32	71,137	1.3	135	287,833	1.4	983	781,167	1.6	3,179
—Chemically treated	8	33	1,868	-	-	13,595	0.1	-	125,170	0.3	-
Tin and Terne Plate—Hot dipped	9	34	178,311	3.3	6	632,004	3.1	228	1,924,657	3.9	-
—Electrolytic	9	35	139,484	2.6	-	455,741	2.2	529	909,173	1.9	-
Sheets—Hot rolled	30	36	630,700	11.6	46,759	*2,379,150	11.6	199,735	5,521,463	11.3	421,198
—Cold rolled	17	37	458,933	8.4	1,899	*1,752,276	8.6	7,496	4,075,554	8.4	3,397
—Galvanized	16	38	134,701	2.5	65	* 525,470	2.6	129	1,462,053	3.0	1,725
—Electrical and enameling	10	39	49,961	0.9	2	184,175	0.9	307	435,170	0.9	-
Strip—Hot rolled	23	40	151,323	2.8	21,922	577,152	2.8	102,424	1,363,812	2.8	237,176
—Cold rolled	33	41	141,314	2.6	2,385	515,978	2.5	10,521	1,282,146	2.6	25,904
Wheels (car, rolled steel)	5	42	30,699	0.6	2	123,257	0.6	2	252,308	0.5	348
Axles	5	43	16,052	0.3	-	59,287	0.3	53	130,461	0.3	221
All other	-	44	-	-	-	-	-	-	6,266	-	-
TOTAL STEEL PRODUCTS	141	45	5,445,993	100.0	463,721	*20,447,827	100.0	*1,851,259	48,775,532	100.0	4,297,889

During 1946 the companies included above represented 99.5 % of the total output of finished rolled steel products as reported to the American Iron and Steel Institute.

* Adjusted.

Weekly Gallup Polls . . .

Voters Prefer to Use Tax Money to Cut Public Debt

Princeton, N. J.

• • • **The underlying issue** throughout all the Senate debate on tax reduction has been the question: Which is more important, to reduce the heavy tax burden or to cut down some of our colossal national debt?

Many have felt that we should do a little of both. But if the question reduces itself to a choice between the two, the majority of Americans would rather see debt reduction take precedence over tax cutting, according to George Gallup, director, American Institute of Public Opinion.

Of course no American family enjoys paying taxes; the ideal life would be one in which taxing was held to a minimum. But a nationwide survey by the institute finds that fear of the consequences of a huge debt hanging over the nation's economic system ranks somewhat more important in the public mind than does the need for getting income taxes back to more normal proportions.

The issue is of more than temporary interest, for it will recur every year when Congress takes up a new tax bill. The issue was presented to the voters this year in an institute survey, coast-to-coast, on the following:

"The United States today has a billion dollars surplus in its running expense. Should this money be used to reduce income taxes, or should it be used to reduce the national debt?"

The vote:

	Pct
Cut taxes	38
Reduce debt	53
No opinion	9

From the point of view of politics alone, the strategy of making some reduction in both the tax rates and the national debt at the same time would serve to please both factions in the population. Yet the fact that a substantial number of people place debt cutting ahead of tax reduction is significant. It tends to support the conclusion that American voters are not as ready as many critics of democracy have supposed to take all they can from the government and give as little in return as possible.

Of course the group willing to see the present income tax rates remain unchanged includes some citizens who are not income taxpayers.

But also included are many who do have to pay substantial taxes. Statistics show that something like three-fourths of all employed persons are income taxpayers. Among business and professional people polled—a high tax-paying group—three-fifths favored debt reduction rather than tax reduction.

The problem of taxation, as observers have pointed out, is how to raise enough money from the people for governmental operation without dampening the incentive to work.

In England there are many cases where workers refuse to work more than a few days a week because the money they would earn is taken away in taxation.

One classic case cited is that of a highly skilled English engraver who hired out 2 days a week as a gardener, and worked the other 4 days at his regular trade. The demand for engravers is tremendous at the moment and this man could have earned large additional sums by devoting 6 days to his trade instead of only 4. But by collecting his gardener's wage in cash and not reporting the income, he was better off than by working a full week as an engraver at handsome pay—subject to British tax rates.

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Two Uppermost Problems All Over the World Are Listed As Housing and High Living Costs

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• • • **Housing and the high** cost of living are the two uppermost problems that plague the common people of the western world in the wake of the war. That is the conclusion drawn from reports by public opinion poll-takers in eight countries.

Although the war has been over for nearly 2 years, no solution to the housing problem has been found in Britain, the U.S.A., Australia, Canada, Holland or Denmark —at least not to the satisfaction of the people of those countries. It is a significant fact that dissatisfaction over housing is prevalent not only among the people of countries which suffered war damage, but also of countries where nothing at all was destroyed, such as the United States, Canada and Australia.

The analysis by the poll experts is based on surveys conducted among their populations on the question of what is the most important problem facing the nation or the family today.

The chief problems listed by people polled in the individual countries are as follows:

BRITAIN—(1) Lack of housing, finding proper place to live; (2) high prices, high cost of living.

FRANCE—(1) High cost of living, (2) food shortages, (3) unrest in the overseas empire.

U.S.A.—(1) High cost of living, (2) housing.

AUSTRALIA—(1) Housing, (2) strikes.

HOLLAND—(1) Housing, (2) high prices.

CANADA—(1) Cutting taxes, (2) controlling prices, (3) housing.

SWEDEN—(1) Labor shortage, (2) lack of coal and raw materials.

DENMARK—(1) Fuel shortage, (2) lack of raw material, (3) housing.

•

• • • **The phenomenal rise** of President Truman's popularity which began last winter has for the present halted.

From coast to coast, 57 pct of voters polled recently by the institute say they approve of the way he is handling his job as President as compared to 60 pct in a

(CONTINUED ON PAGE 140)

Declares Republic Steel Has Found No Proof Of Black Market Dealings

Cleveland

• • • **None of the** large, reputable steel producers have at any time knowingly made sales of steel that could get into any irregular channels, Norman W. Foy, general sales manager, Republic Steel Corp., declared.

In a letter to Sen. Francis J. Myers (D, Pa.) of the Senate Interstate & Foreign Commerce Committee, Senator Foy said that he had noted statements made by Tom J. Smith, Jr. (president, Pressed Metal Institute).

"When he (Mr. Smith) states that 'we feel some steel companies know about it' (the so-called black market) I assume he means to infer that some steel companies are participants in the practice.

"Speaking for Republic Steel Corp. alone, we have diligently pursued every report that involved Republic's product in such transactions and have found that all such tonnage offers consist entirely of conversation," Mr. Foy said.

He said reports of tons of thousands or even thousands of tons of Republic Steel offered at high prices have not at any time disturbed Republic, because Republic's shipments of steel in such quantities are confined to a very few large consumers who are themselves in great need of steel for their legitimate operations and could not conceivably be involved in such transactions.

Mr. Foy said Republic has been far more concerned about the reports of carload or even 50-ton lots and have gone to considerable length to trace down such reports, but "have found actual evidence of irregular prices in only one or two minor instances, where appropriate action has immediately been taken."

"It has been our experience that such 'evidence' amounts to nothing, since such parties invariably either deny using a producer's name in making the offer, or claim the information was given them by some third party, who is equally hard to pin down," Mr. Foy added.

"All of our investigation indicates there is very little tonnage which can be considered in this category and it seems to me that the present hearings before the Senate Subcommittee on small business tend to bear out this conclusion," he concluded.

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Cleveland

• • • **Mr. Foy's letter** drew sharp rebuttal from Mr. Smith, who declared:

"For your information, we [Pressed Metal Institute] have, since Apr. 7 to June 4, sent to the American Iron & Steel Institute, Federal Trade Commission and the Senate Small Business Committee 16 batches of non-duplicating offerings of sheet and strip that totaled more than a million tons.

"These are telegraphic, telephone and bona fide quotations, circular letters and other forms of tenders submitted to our members and others cooperating with us and are, we assume, being investigated by the several agencies."

Mr. Smith charged that recent testimony before the Senate Small Business Committee seemingly involved one of the district offices of Republic Steel Corp. in an overpriced transaction.

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UAW Complains on Steel

Detroit

• • • **Attributing recent layoffs** of workers and continuing short work weeks to steel shortages, Walter P. Reuther, energetic UAW-CIO president, has asked Senator Kenneth S. Wherry, chairman of the steel subcommittee of the Senate special committee to study the problems of American small business to investigate the overall problem of capacity, production and distribution of steel.

In a statement filed with the subcommittee, Reuther declared that total steel production for the first quarter of 1947 was 35 pct above the quarterly average for 1940, yet automobile production was only 4 pct above the quarterly average of 1940. Reuther also asserted that the automobile industry received 13 pct of total steel products in the fourth quarter of 1946 compared with 16 pct of the steel total in 1940. He asserted further that the latest reports show the industry getting 31½ pct of total sheet and strip compared with 44 pct in 1940.

He further charged that the automobile industry purchased more than 51 pct of its sheet and strip in cold-rolled form during the last quarter of 1946, whereas it purchased only 37 pct of sheet and strip in the cold-rolled form in 1940.

Coming Events

June 15-19 American Society of Mechanical Engineers, semiannual meeting, Chicago.
June 16-20 American Society for Testing Materials, annual meeting, Atlantic City, N. J.
June 17-19 Machinery Dealers National Assn., convention, Cincinnati.
June 23-27 American Electroplaters Society, industrial finishing show, Detroit.
June 23-28 Railway Supply Manufacturers' Assn., Atlantic City, N. J.
June 25 National Assn. of Metal Finishers, Inc., annual meeting, Detroit.
July 14-18 American Society of Civil Engineers, Duluth, Minn.
Aug. 25-29 National Assn. of Power Engineers, Inc., Boston.
Sept. 8-12 Instrument Society of America, conference, Chicago.
Sept. 10-12 Porcelain Enamel Institute, Inc., Columbus, Ohio.
Sept. 17-26 National Machine Tool Builders' Assn., machine tool show, Chicago.
Sept. 29-Oct. 3 American Gas Assn., San Francisco.
Oct. 31 Illinois Mining Institute, annual meeting, Springfield, Ill.
Oct. 30-Nov. 1 American Society of Tool Engineers, semi-annual meeting, Boston.

Oxygen Firm Outlines Its Research Program For Steelmaking Applications

Jet Device Boosts Roof Life; Large Capacity Pilot Unit Makes 90 Pct Gas

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New York

• • • **Use of a jet device** to direct a high velocity oxygen stream at preheated scrap highlighted a review of steps being taken by Linde Air Products Co. to provide oxygen for steelmaking. Linde's research along these lines was outlined to the technical press last week in trips through the company's Tonawanda, N. Y., research laboratory and its East Chicago, Ind., oxygen plant. The company also stated that it was operating a pilot size large capacity gaseous oxygen plant producing 90 pct purity oxygen.

In addition to the highlights surrounding the production and use in industry of Linde "Driox" liquid oxygen, which has been in commercial use since the early 1930's, company officials also emphasized the importance of a large-scale development program, currently underway, which embraces (1) the design, operation and testing of a pilot-size large capacity gaseous oxygen plant, (2) investigation of the uses for oxygen in the metallurgical industries, (3) study of the oxygen demand characteristics of metallurgical processes, and (4) determination of the physical conditions under which large capacity gaseous oxygen plants on customers' property will have to operate.

Of particular interest were the summarizations of D. L. I. Dana, research manager, New York, and Dr. J. M. Gaines, assistant superintendent, Tonawanda Laboratory, of the use of 99.5 pct oxygen in scrap melt-down and decarburization in the openhearth, and decarburization in the electric furnace. On the basis of some 5000 heats in basic openhearths and electric furnaces, the performances of various openhearth melt-down techniques, such as (1) supplying oxygen through end burners, (2) use of a jet device wherein a high velocity oxygen stream is directed at preheated scrap, (3) use of oxygen in auxiliary burners, and (4) introduction of oxygen through the checkers; and two means for shortening the decarburization periods in the openhearths and electric furnace, one, the oxygen lance, and two, the jet device, were evaluated from the standpoint of operating technique and efficiency.

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JET BATH: *Looking through the door of an openhearth as Linde's jet device directs oxygen at the molten bath. In this particular heat, carbon was brought from 20 points to 5 points in about 20 min.*

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In addition to the results obtained, based on steelmaking operations, data were presented which included the construction and testing of a wide variety of special burners and oxygen-injection devices, and the study of flame characteristics of burners. The study of burners has been underway for some time at the Tonawanda Laboratory, utilizing a 30-ft long brick-lined kiln.

Dr. Dana emphasized that the particular conditions existing in any individual shop will determine to a large extent whether oxygen should be employed. He expressed the belief that oxygen can be used in openhearth practice to increase output of almost any shop.

Factors influenced by the use of oxygen (and the manner in which it is used) were outlined as (1) shop operating procedures, (2) materials charged, and (3) equipment. Use of oxygen through burners and directed onto preheated scrap to accelerate charge melt-down, is most effective for shops which use 35 pct or more cold scrap, and for shops which contain relatively old, inefficient furnaces, while injection of oxygen into the bath is most useful in shops employing large amounts of hot metal in the charge, and in shops which produce low carbon steels. When large amounts of carbon must be removed quickly from the bath oxygen injection in the bath is advantageous. Maximum benefit from oxygen, in some cases, may require utilization of oxygen for both melt-down and for refining during the processing of a single heat.

Most damage to roof refractories has resulted from slagging the roof with quantities of molten iron and slag caused by extremely vigorous splashing when using the oxygen lance. Considerable improvement in roof life has been secured by increasing the effective roof height and taking care to direct splashing away from the roof. Use of two lances in place of one would be expected to lengthen roof life materially by reducing the amount of splashing. The high velocity jet injection has repeatedly produced much less smoke and splash than

Industrial Briefs . . .

• MOVES OFFICE—Patch & Talmage, powder metallurgy, have expanded their pilot plant and laboratory facilities at South Wilton, Conn., and have moved their offices to Wilton, Conn., to be nearer those operations.

• EXPANDS BUSINESS — The Carroll Dividing Head Co., recently formed in Cincinnati, is now under the leadership of Fred C. Kelly. The new company is expanding the business and modernizing manufacturing procedures.

• BRANCH OFFICE—Baron Steel Co. announces the opening of a branch office at Detroit, located 1863 National Bank Bldg. The office is under the direction of Robert E. Schrag, who has been with the Toledo main warehouse office.

• WAA SALES — A war surplus carbon electrode plant in Punxsutawney, Pa., has been sold by WAA to the wartime operator, Speer Carbon Co., St. Marys, Pa., for $500,000 cash on closing. At the same time, WAA made public the sale of a beryllium oxide and metal plant at Lorain, Ohio, to the Brush Beryllium Co. for $45,000.

• POWER FACILITIES SOLD — Wartime electric facilities to furnish power to the Morgantown, W. Va., Ordnance Works, formerly operated by the E. I. duPont de Nemours & Co., have been sold for $460,000 cash to the Monongahela Power Co., Fairmont, W. Va.

• STUDY PROGRAM—A program started last year to enable scientists to renew their studies and to establish close cooperation between industry and university laboratories has been further extended by the Monsanto Chemical Co. Three industrial scientists from their engineering division have just been awarded leaves of absence at full salary for an academic year of study at the universities of their choice.

• APPROVES LOAN—RFC Chairman John D. Goodlow announced that the RFC has approved a $16,600,000 loan to the Glenn L. Martin Co., of Baltimore, to meet current needs. It will be primarily for working capital in production of commercial transport planes.

• NEW APPOINTMENT — Edwin C. Barringer, executive secretary of the Institute of Scrap Iron & Steel, Inc., of Washington, has been appointed to the Natural Resources Dept., Committee of the Chamber of Commerce of the United States.

• DELCO TAKES OVER — GMC, through its Delco Radio Division, has acquired a long-term lease on a group of buildings totaling approximately 160,000 sq ft in one of the Clearing Industrial District properties in Chicago. Delco has taken over the operation formerly carried on by RCA, which manufactured automobile radios for GMC cars.

• MOVING—The A. B. Dick Co., manufacturers of mimeograph machines and other office appliances, has acquired a site of more than 50 acres on which to build a plant of 600,000 sq ft, and to which the entire operations of this company will be moved. The new site is in the village of Niles, Ill.

• NEW SUBSIDIARY—Establishment of the New Holland Metals Co. at Leola, Pa., has been announced. It will be a subsidiary of the New Holland Machine Co., producers of farm and industrial equipment. George C. Delp is president.

• RE-OPENS OFFICE—Link-Belt Co. has reestablished a sales office in Washington, D. C., located at 11th & H Sts. N. W. The company's Washington representative, C. R. Heller, is in charge of the office. Industrial sales in the District of Columbia will continue to be handled by the company's office in Baltimore.

lance injection of similar oxygen flow rates.

In order to obtain a true overall picture of the use of oxygen, Linde Air Products has initiated a program, experimenting with the injection of compressed air in the bath for carbon reduction. A few preliminary data already obtained, using the jet device, indicate the rates of carbon reduction to lie between normal practice and use of 99.5 pct oxygen. It was pointed out, however, that because of the larger volume of gas which must be blown through lances or jets when compressed air is employed, in order to procure the same total quantity of oxygen in the bath, the technique of lance or jet injection may have to be modified in order to obtain the equivalent oxidizing action at comparable speeds.

Dr. Gaines introduced some interesting concepts concerning the economics of oxygen use, in which the cost of oxygen was considered against the cost of those items known to be substantially affected by oxygen use, namely, fuel, labor and overhead. For this analysis in openhearth furnaces, a cost figure of $36 per ton (15¢ per 100 cu ft) was used, which price had been made available for experimental uses, by the Linde Air Products Co., to its customers.

L. A. Bliss, vice-president, in a discussion of the various aspects of oxygen production and distribution, pointed to the advantages to the consumer of liquid oxygen which can be stored against fluctuating steel mill demand as contrasted with the construction of gaseous oxygen plants on the user's property.

If it should appear that the future demands for metallurgical oxygen will be such that the present "Driox" oxygen system cannot meet the requirements in terms of volume, or is uneconomical, said Mr. Bliss, it may well be that individual gaseous oxygen plants of large capacity may have to be installed at certain specified locations. With this in mind, the company constructed a pilot-size, large capacity gaseous oxygen production plant, which has now been in operation more than seven months. This unit is said to be the largest single unit for producing gaseous oxygen ever built, having a capacity of about 4.8 million cu ft per day of 90 pct oxygen obtained from a single fractional distillation unit.

Construction Steel . . .

• • • Fabricated steel awards this week included the following:

2700 Tons, Detroit, transmission towers for Detroit Edison Co., to American Bridge Co., Pittsburgh.

2300 Tons, Gadsden, Ala., power plant for Alabama Power Co., to Ingalls Iron Works Co., Birmingham.

800 Tons, Rockford, Ill., power station for Central Illinois Electric & Gas Co., to unnamed fabricator through Stone & Webster Engineering Corp., Boston.

425 Tons, Firebaugh, Calif., two bridges across San Joaquin River and overflow, Charles MacClosky Co., to Bethlehem Pacific Coast Steel Corp., San Francisco.

370 Tons, Urbana, Ill., fine arts building, University of Illinois, to Midland Steel Products Co., Cleveland.

350 Tons, Philadelphia, building for Institute for Cancer Research, to Lehigh Structural Steel Co., Allentown, Pa.

340 Tons, Mechanicsburg, Pa., paint and oil storehouse, Naval Supply Depot, to Bethlehem Steel Co., Bethlehem.

250 Tons, Vienna, Md., Eastern Shore Public Service Co., to Maryland Steel Products Co., Baltimore.

215 Tons, Jeffersonville, Ind., building for Colgate-Palmolive-Peet Co., to Whitehead & Kales, Detroit.

160 Tons, Philadelphia, bridge over Cobbs Creek, City of Philadelphia, to American Bridge Co., Pittsburgh.

150 Tons, Luzerne County, Pa., bridge reconstruction on route 40117 section 1-A, Pennsylvania Dept. of Highways, to Pine Iron Works, Pine Forge, Pa.

• • • Fabricated steel inquiries this week included the following:

7250 Tons, sea going dredge, U. S. Army Engineering Corps.

3500 Tons, Durham, N. C., plant building for Liggett & Meyers Tobacco Co., St. Louis.

2740 Tons, Luzerne County, Pa., seven truss spans, Pennsylvania Dept. of Highways, due June 20.

2300 Tons, Philadelphia, Market St. subway, postponed to June 30.

1745 Tons, Decatur, Neb., bridge, Burt County Bridge Commission.

1600 Tons, Montague, Mass., state bridge.

725 Tons, Gloucester County, N. J., bridge, New Jersey Dept. of Highways, due June 25.

620 Tons, Cape May County, N.J., Corsons Inlet bridge, bids rejected.

400 Tons, Fort Wayne, Ind., bridge for state of Indiana has been abandoned.

300 Tons, Pottsville, Pa., building for Etna Steel Products Co., due June 9.

280 Tons, Jefferson County, Pa., plate girder, bridge, Pennsylvania Dept. of Highways, due June 20.

250 Tons, Philadelphia, extension to turbine test building, Navy Yard, due June 12.

150 Tons, Philadelphia, alterations to machine room, Container Corp., due June 13.

150 Tons, Chesterfield, Mass., state bridge.

• • • Reinforcing bar awards this week included the following:

1000 Tons, East Peoria, Ill., Caterpillar Tractor building to Bethlehem Steel Co., Bethlehem.

550 Tons, Tacoma, for Wash. Farmers Assn., Jones-Hettelsater Construction Corp., to Northwest Steel Rolling Mills, Seattle.

470 Tons, Spec. 9821—auxiliary service buildings, Harbor Steam Plant, Units 3, 4 and 5, Guy F. Atkinson Co., to Blue Diamond Corp., Los Angeles.

300 Tons, Rockford, Ill., generating plant for Central Illinois Electric & Gas Co., Stone & Webster Engineering Co., contractor, to Carnegie-Illinois Steel Corp., Pittsburgh.

135 Tons, Modesto, Calif., bridge across Tuolumne River, Erickson, Phillips & Weisberg, to San Jose Steel Co., San Jose, Calif.

120 Tons, Firebaugh, Calif., two bridges across San Joaquin River and overflow, Charles MacClosky Co., to Bethlehem Pacific Coast Steel Corp., San Francisco.

105 Tons, Weitchpec, Ore., bridge and approaches across Klamath River, Clifford A. Dunn, to Bethlehem Pacific Coast Steel Corp., San Francisco.

100 Tons, Hardwick, Calif., bridge over Kings River, Klay-Bennett Construction Co., to San Jose Steel Co., Inc., San Jose, Calif.

100 Tons, Seattle, for Fisher Flouring Mills, George Teafel, construction, to Northwest Steel Rolling Mills, Seattle.

• • • Reinforcing bar inquiries this week included the following:

600 Tons, Rapid City, S. D., hangar for U. S. Army air base.

110 Tons, Sacramento, Calif., Calif. Div. of Highways, Public Works Building, Sacramento for two reinforced concrete slab bridges on Ostrom Road between Plumas School and FAS Rt. 922, bids to July 2.

100 Tons, Savannah, Ga., plant for Union Bag & Paper Corp., Morton C. Tuttle Co., Boston engineers.

• • • Sheet piling awards this week included the following:

190 Tons, South Chicago, docks for International Harvester Co. to Carnegie-Illinois Steel Corp., Pittsburgh.

• • • Sheet piling inquiries this week included the following:

480 Tons, Quincy, Ill., sea wall for the state of Illinois, Division of Waterways.

• • • Railroad car awards this week included the following:

The Santa Fe Ry. has ordered 250 70-ton drop end gondola cars and 125 70-ton covered hopper cars from American Car & Foundry Co. The 250 cars will be built at their St. Louis plant and American Car & Foundry will ship the first quarter of 1948. The hopper cars will be shipped from their Madison, Ill. plant early in the second quarter of 1948. New York Central has ordered 2000 50-ton steel sheathed box cars; 1000 from ACF to be built at Berwick, Pa., and 1000 from Greenville Steel Car Co., Greenville, Pa. The Duluth, Mesabi & Iron Range R.R. has ordered 2000 70-ton ore cars; 500 will be built by ACF at Madison, Ill., 500 by General American Transportation at East Chicago, 500 by Pressed Steel Car Co., McKeesrocks, Pa., and 500 by Pullman-Standard Car Mfg Co., Butler, Pa. The Louisville & Nashville R.R. has ordered 1500 50-ton hopper cars from Pullman-Standard Car Mfg Co., at Bessemer, Ala., and 1500 50-ton hopper cars from Bethlehem Steel Co.

• • • Railroad car inquiries this week included the following:

E. I. du Pont de Nemours & Co. is inquiring for 15 covered hopper cars to carry corrosive nylon salts. Specifications call for 100 pct stainless steel interior.

• • • Railroad locomotive awards this week included the following:

The Santa Fe has just placed orders for 25 new diesel electric locomotives with four of the leading locomotive builders of the country. Eight 6000 hp passenger locos will be built by Electro-Motive division of General Motors at LaGrange, Ill.; four 4000 hp passenger locomotives and four 1000 hp switching locomotives will be built by American Locomotive Co., Schenectady, N. Y.; six 1000 hp switching locomotives and one 2000 hp transfer engine will be built by the Baldwin Locomotive Works, Eddystone, Pa.; and two 1000 hp switching locomotives will be built by Fairbanks Morse & Co., at Beloit, Wis.

The Missouri & Pacific R.R. has ordered 111 diesel units—66 to be built by Electro Motive Div. of GMC, 30 units by American Locomotive and 15 by Baldwin Locomotive Co.

The Baldwin Locomotive Co. has been awarded three diesel electric passenger locomotives for the Central R.R. of New Jersey as well as eight 2-8-2 steam locos for United Fruit Co.

Daily Average Rate Of Pig Iron Output In Canada for April Up

Toronto

• • • While Canadian pig iron production showed a slight decline in April from the month immediately preceding, the daily average rate was up. Output of pig iron in April amounted to 160,749 net tons or an average daily rate of 71.2 pct, compared with 164,403 tons in March when the daily average was 70.5 pct, and with output of 142,240 tons in April 1946. The month's output included 128,233 tons of basic iron, of which 119,663 tons were for further use and the balance for sale; 18,823 tons of foundry iron, of which 629 tons were for further use and 18,823 tons for sale, and 13,064 tons of malleable iron, all for sale.

During April one blast furnace was blown in, making a total of 10 furnaces blowing and 4 stacks blown out. Charges to blast furnaces included 308,347 tons of iron ore, 10,900 tons of mill cinder, scale, sinter, etc., and 4010 tons of scrap iron and steel.

For the first 4 months of this year cumulative production of pig iron totaled 653,097 net tons, as compared with 587,032 tons in the corresponding period of 1946 and 627,343 tons in 1945.

Production of ferroalloys in April dipped to 13,015 tons from 14,197 tons in March and compares with 13,083 tons in April last year. The month's output included ferrosilicon, silicomanganese, ferromanganese, ferrochrome, chrom-x and ferrophosphorus.

Ferroalloys produced in the first 4 months of this year totaled 46,123 net tons compared with 43,238 tons in the 1946 period and 60,316 tons in 1945.

Following are comparative production figures by months for 1947 in net tons:

1947	Pig Iron	Ferroalloys
January	177,313	9,644
February	150,632	9,357
March	164,403	14,197
April	160,749	13,015
Total 4 months...	653,097	46,213

MACHINE TOOLS

. . . News and Market Activities

Five Eastern Builders Announce 10 Pct General Price Increase

• • • **Price increases announced** recently by some machine tool builders are the chief topic of conversation around the machine tool trade this week, as all evidence points to a continuation of the trend which began about three weeks ago.

In the East, five major producers have announced 10 pct price increases effective immediately, and a number of machine tool builders in the middle west have also increased prices by varying amounts. Many of the price increases have been straight across the board covering machines, tools and attachments.

Turret lathes, milling machines, grinders, broaches and lathes are included in the types of equipment affected thus far, and according to reports, the price increases have resulted in an upsurge of ordering.

Despite the price increases, some major producers still do not feel they can buy machines of their own manufacture from War Assets Administration stocks, rebuild them, and come out of the transaction with a profit. One major producer in the Cleveland area has been flirting with this idea for some months, but as yet has been unable to buy any of his machines at a price which would make rebuilding in his own shops feasible.

Another machine tool builder in the same area has been able to buy limited numbers of his own machines from WAA for rebuilding. Results thus far, however, do not suggest that rebuilding war-worn machine tools is the most profitable direction for a machine tool builder to turn his efforts.

In some sectors, it has been reported that the price increases recently announced have brought about a switch in buying surplus tools from WAA to a "flood of orders" for new tools from distributors.

According to qualified observers, machine tool markets in most sectors are so spotty at the moment that few, if any, general conclusions can be drawn. Some machine tool builders, lathe makers

One Producer Buying Limited Numbers of Own Surplus Tools to Rebuild

o o o

for example, are getting a good flow of new firm orders. Other lines are very quiet, and over-all figures for the machine tool industry show the spottiness of the business at the moment, trade sources pointed out. Three shifts are being worked in some plants, while others are looking for contract work.

Some new business is being placed at this time because of a fear that prices for machine tools may advance still higher, and also because WAA stocks of some types of equipment are either completed, depleted or simply obsolescent machines. Most of the really good machine tools still owned by the government and in great demand on the market are being rented to lessees in possession.

WAA has been moving very little equipment lately in some parts of the country and has set up a plan now whereby sales can go ten days before WAA will pay any dealer commissions on equipment sold. At the same time, War Assets Administrator Robert M. Littlejohn has announced a second step in his previously proposed plan to reduce the size of WAA as surplus stocks dwindle. On June 30 WAA will be contracted to a total of 41,800 employees in Washington and the field as compared with approximately 45,000 at present. According to Mr. Littlejohn, more than half the estimated total surplus property has been disposed of.

Hopes of some machine tool builders for a boom in machine tool exports were scarcely bolstered by a talk given in New York last week by D. W. Michener, associate director of research, Chase National Bank.

Mr. Michener said trade indicators reveal that the boom in United States exports is about over, despite current totals equivalent to $1,000,000 a day for every state in the nation. He said the boom is wearing off even in international trade where the need for American goods is almost unlimited.

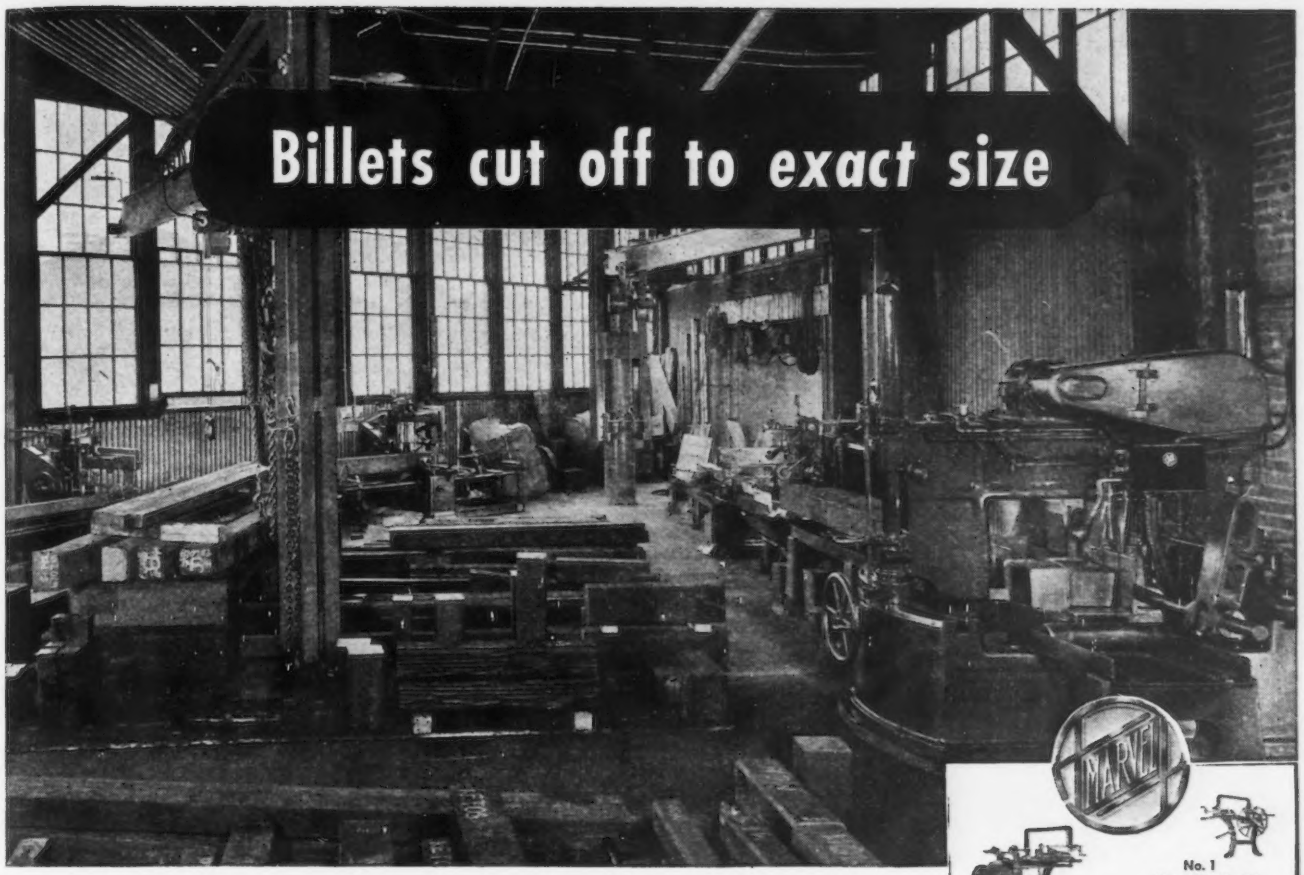
In Detroit the volume of machine tool business is reported by trade sources as varying from fair to dull. Some new orders are still being placed and inquiries are coming in, but the concensus is that the volume of business will continue to be slow, at least until after the Machine Tool Show in Chicago.

The trend toward the practice of quoting firm prices is growing here and it is now reported to be standard practice to quote firm prices on most items to be delivered in six or seven months or less. Certain electrical equipment such as starters and push buttons is sometimes excepted, but the trend toward firm prices is definite.

Current reports that WAA has declared only about 50 pct of its nationwide equipment would not appear to apply in Detroit. A survey here shows that no important manufacturers have failed to declare their equipment. The number of machines piled up in Detroit warehouses would indicate further that this is the case.

Sales of equipment such as gages and other perishable items are slow but there are indications here that price reductions rather than price increases may be in the offing.

In the East, dealers report that May orders have been better than any months this year. Meanwhile, inquiries continue to come in at a high level. Inquiries are well diversified as to type of tool required and as to the number of users who are seeking new tools. Although price increases have been announced by some builders recently, there are many others who are not considering action until the status of pending wage increases is clarified. Deliveries are good except for specialized equipment which has been brought down to seven to eight weeks' delivery from the former backlogs of four to five months.



ANY QUANTITY CUT-OFF AUTOMATICALLY

These MARVEL Saws are money makers for this modern forge shop in many ways. (1st) they cut off billets for a small fraction of the cost of cutting-off with a hammer. (2nd) these billets are so accurate in size that they exactly fill the dies with no excess fin, not only simplifying trimming and finishing, but getting extra billets from many bars. (3rd) they keep all hammers busy on *production* work for these "world's fastest" saws can keep ahead of any schedule. (4th) they reduce cutting-off labor costs to an absolute minimum. It takes only one operator and a helper to keep all of these saws running because all but the No. 18 Giant Hydraulic Saw (at the right) are *automatic*-feed measure, and cut-off identical billets; requiring no more attention than automatic screw machines.

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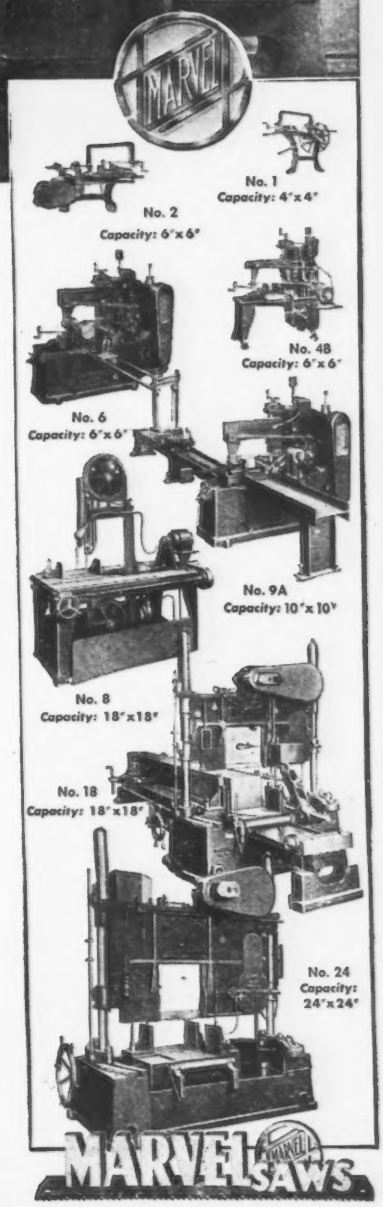
MARVEL SAWS



NONFERROUS METALS

. . . News and Market Activities

Copper

• • • **Last week's indication** of weakness in the export copper market has reacted quickly on the domestic market and has resulted in ending the price spread which has existed in the domestic market since May 7. One primary producer continued to price copper at 24¢ as late as Monday this week, but reports indicate that there have been few sales at that price and only for immediate delivery. Custom smelters have brought down their copper price to the 21.50¢ level. Brass mills and wire mills which had raised their fabricated price level to the 23¢ copper basis during the last week in May have revised their prices downward, some to the 22.00¢ level, others to 21.50¢ basis. One fabricating subsidiary raised its prices to the 23.00¢ level for a single day.

The world copper market, reported to continue early last week at the peak price of 23.75¢ f.a.s. New York, has declined to a low price of 21.50¢ f.a.s. New York. Other sales have been made at somewhat higher figures but there is no evidence that any transactions have taken place at the previous market price. The foreign copper price decline was dictated by the placement of orders for good tonnages at lower prices for third and fourth quarter delivery by the British Ministry of Supply.

Producers report their inability to meet all current domestic requirements with 21.50¢ copper. Since some purchases of foreign copper have been placed at the equivalent of 21.625¢ delivered Connecticut Valley, if the trend continues it should be possible to obtain all current requirements from domestic and foreign production at the domestic price of 21.50¢. Brass mill orders are reported to be continuing light due to the 2-week vacation shutdown and inventory restriction. Wire mills continue ready to buy all copper offered at the 21.50¢ price.

•

Zinc

• • • **The market for** zinc continues easy for most grades although some producers indicate that there is still a shortage of Prime Western and Special High Grade. The figures released by the American Zinc Institute for May operations are significant when considered in conjunction with reports of a weakening of the foreign zinc market. The export zinc price is currently quoted at 10.00¢ f.a.s. Gulf Ports, which is approximately the break even price with the domestic market. May figures indicate that domestic shipments have dropped from the previous month by 2888 tons while export shipments have increased by 1448 tons. Production has remained relatively constant at 73,970 tons but stocks at the end of the month have increased by more than 3000 tons to 166,864. If the foreign market should continue to weaken, observers are of the opinion that the wiping out of the export sales market would create a surplus tonnage that could not be absorbed by the domestic market without jeopardizing current market prices.

•

Mineral Subsidy to House

Washington

• • • **The House Rules** Committee has placed before the House the Russell Bill (HR-2455), providing continued price support for marginal and high cost lead, zinc and copper mining. Early action is forecast for the measure which provides a Mineral Resources Division and authorizations for it to continue for a five-year period premium payments based on a return to the producer of 18¢for lead and zinc, and 28¢ for copper. These maximum limits may be lifted in special cases to encourage exploration and development. Metal mined under subsidization will be offered on the open market except for probable stockpiling set-asides.

•

Magnesium Shipments Drop

New York

• • • **Shipments of magnesium** products declined in March from the previous month, it is reported by the Magnesium Assn. Shipments of castings, including sand, permanent mold and die, declined to 677,000 lb from February's 707,000 lb. Wrought products dropped to 588,000 lb, including 327,000 lb of extrusions, from February's total of 752,000 lb.

•

To Drop Metals Controls

Ottawa

• • • **While Canadian officials** decline to make a definite statement, it is learned that consideration is being given to the dropping of controls and ceiling prices on copper, lead, zinc and a number of other commodities. Some interests claim that this action may be taken by the end of the month. In the meantime, however, the domestic copper price is pegged at 16.625¢ per lb. Copper exports to Great Britain, which have been pegged at around 18½¢ a pound, will be increased to the average world price for the first six months of this year, effective July 1. Speculative buying and hoarding of copper has been reported in some quarters in the expectation of higher prices, although fabricators are said to be excluded from this group and the majority are working on only short term inventories.

Nonferrous Metals Prices

Cents per pound

	June 4	June 5	June 6	June 7	June 9	June 10
Copper, electro, Conn.	21.50—23.00	21.50—22.00	21.50—22.00	21.50—22.00	21.50—....	21.50—....
Copper, Lake, Conn.	21.625	21.625	21.625	21.625	21.625	21.625
Tin, Straits, New York	80.00	80.00	80.00	....	80.00	80.00
Zinc, East St. Louis	10.50	10.50	10.50	10.50	10.50	10.50
Lead, St. Louis	14.80	14.80	14.80	14.80	14.80	14.80

Primary Metals

(Cents per lb, unless otherwise noted)

Aluminum, 99+%, f.o.b. shipping point (min. 10,000 lb) 15.00
Aluminum pig, f.o.b. shipping point 14.00
Antimony, American Laredo Tex... 33.00
Beryllium copper, 3.75-4.25% Be; dollars per lb contained Be.....$14.75
Beryllium aluminum, 5% Be; dollars per lb contained Be $27.50
Cadmium, del'd $1.75
Cobalt, 97-99% (per lb)....$1.50 to $1.57
Copper, electro, Conn. Valley 21.50
Copper, lake, Conn. Valley 21.625
Gold, U. S. Treas., dollars per oz.. $35.00
Indium, 99.8%, dollars per troy oz. $2.25
Iridium, dollars per troy oz.....$85 to $95
Lead, St. Louis 14.80
Lead, New York 15.00
Magnesium, 99.8+% 20.50
Magnesium, sticks, carlots 36.00
Mercury, dollars per 76-lb flask, f.o.b. New York.....$85.00 to $87.00
Nickel, electro, f.o.b. New York.... 37.67
Palladium, dollars per troy oz. .$24.00
Platinum, dollars per troy oz. $58 to $61
Silver, New York, cents per oz..... 70.75
Tin, Straits, New York..... 80.00
Zinc, East St. Louis 10.50
Zinc, New York 11.005
Zirconium copper, 6 pct Zr, per lb contained Zr $8.75

Remelted Metals

Brass Ingot

(Cents per lb, in carloads)

85-5-5-5 ingot
No. 115 ..... 19.50
No. 120 ..... 19.00
No. 123 ..... 18.50
80-10-10 ingot
No. 305 ..... 23.50
No. 315 ..... 21.75
88-10-2 ingot
No. 210 ..... 28.25
No. 215 ..... 27.25
No. 245 ..... 21.75
Yellow ingot
No. 405 ..... 15.75
Manganese Bronze
No. 421 ..... 17.50

Aluminum Ingot

(Cents per lb, lots of 30,000 lb)

95-5 aluminum-silicon alloys:
0.30 copper, max. 15.75
0.60 copper, max. 15.50
Piston alloys (No. 122 type)..... 14.50
No. 12 alum. (No. 2 grade) 14.00
108 alloy 14.25
195 alloy 14.75
AXS-679 ..... 14.25
Steel deoxidizing aluminum, notch-bar, granulated or shot
Grade 1—95 pct-97½ pct 14.50
Grade 2—92 pct-95 pct 13.00
Grade 3—90 pct-92 pct 12.25
Grade 4—85 pct-90 pct 11.75

Electroplating Supplies

Anodes

(Cents per lb, f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed
Cast, oval, 15 in. or longer..... 39⅛
Electrodeposited 33⅞
Rolled, oval, straight, delivered.. 34⅝
Brass, 80-20, frt allowed
Cast, oval, 15 in. or longer 34⅞
Zinc, Cast, 99.99 ..... 18¾
Nickel, 99 pct plus, frt allowed
Cast 51
Rolled, depolarized 52
Silver, 999 fine
Rolled, 1000 oz lots, per troy oz... 75¼

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 100 lb drum..... 43.00
Copper sulphate, 99.5, crystals, bbls 11.50
Nickel salts, single, 425 lb bbls, frt allowed 14.50
Silver cyanide, 100 oz. lots, per oz. 60⅝
Sodium cyanide, 96 pct, domestic, 200 lb drums 15.00
Zinc cyanide, 100 lb drums..... 34.00
Zinc, sulphate, 89 pct, crystals, bbls, frt allowed 7.75

Mill Products

Aluminum

(Cents per lb, base, subject to extras for quantity, gage, size, temper and finish)

Drawn tubing: 2 to 3 in. OD by 0.065 in. wall: 3S, 43.5¢; 52S-O, 67¢; 24S-T, 71¢; base, 30,000 lb.

Plate: ¼ in. and heavier: 2S, 3S, 21.2¢; 52S, 24.2¢ 61S, 23.8¢; 24S, 24S-AL, 24.2¢; 75S, 75S-AL, 30.5¢; base, 30,000 lb.

Flat Sheet: 0.136-in. thickness: 2S, 3S, 23.7¢; 52S, 27.2¢; 61S, 24.7¢; 24S-O, 24S-OAL, 26.7¢; 75S-O, 75S-OAL, 32.7¢; base, 30,000 lb.

Extruded Solid Shapes: factor determined by dividing the perimeter of the shape by its weight per foot. For factor 1 through 4, 3S, 26¢; 14S, 32.5¢; 24S, 35¢; 53S, 61S, 28¢; 63S, 27¢; 75S, 45.5¢; base, 30,000 lb.

Wire, Rod and Bar: screw machine stock, rounds, 17S-T, ¼ in., 29.5¢; ½ in., 37.5¢; 1 in., 26¢; 2 in., 24.5¢; hexagons, ¼ in., 35.5¢; ½ in., 30¢; 1 in., 2 in., 27¢; base, 5000 lb. *Rod:* 2S, 3S, 1¼ to 2½ in. diam, rolled, 23¢; cold-finished, 23.5¢ base, 30,000 lb. *Round Wire:* drawn, coiled, B & S gage 17-18; 2S, 3S, 33.5¢; 56S, 39.5¢; 10,000 lb base. B & S gage 00-1: 2S, 3S, 21¢; 56S, 30.5¢. B & S 15-16; 2S, 3S, 32.5¢; 56S, 38¢; base, 30,000 lb.

Magnesium

(Cents per lb. f.o.b. mill. Base quantity 30,000 lb.)

Sheet and Plate: Ma. FSa. ¼ in., 54¢-56¢; 0.188 in., 56¢-58¢; B & S gage 8, 58¢-60¢; 10, 59¢-61¢; 14, 69¢-74¢; 16, 79¢-81¢; 18, 87¢-89¢; 22, $1.25-$1.31; 24, $1.71-$1.75.

Round Rod: M, diam, in., ¼ to ⅜, 47¢; ½ to ¾, 45¢; 1¼ to 2½, 43.5¢; 3½ to 5, 42.5¢. Other alloys higher.

Square, Hexagonal Bar: M, size across flats, in., ¼ to ⅜, 52.5¢; ½ to ¾, 47.5¢; 1¼ to 2½, 45¢; 3½ to 5, 44¢. Other alloys higher.

Solid Shapes, Rectangles: M, form factors, 1 to 4, 46¢; 11 to 13, 49¢; 20 to 22, 51.5¢; 29 to 31, 59.5¢ 38 to 40, 75.5¢ 47 to 49, 98¢. Other alloys higher.

Round Tubing: M, wall thickness, outside diam, in., 0.049 to 0.057, ¼ to 5/16, $1.21; 5/16 to ⅜, $1.12; ⅜ to 7/16, 97¢; 0.058 to 0.064, 7/16 to ½, 89¢; ½ to ⅝, 81¢; 0.065 to 0.082, ⅝ to ¾, 76¢; ¾ to 1, 72¢ 0.083 to 0.108, 1 to 2, 68¢; 0.165 to 0.219, 2 to 3, 59¢; 3 to 4, 57¢. Other alloys higher.

Nickel and Monel

(Cents per lb, f.o.b. mill)

	Nickel	Monel
Sheets, cold-rolled	54	43
No. 35 sheets	..	41
Strip, cold-rolled	60	44
Rod		
Hot-rolled	50	39
Cold-drawn	55	44
Angles, hot-rolled	50	39
Plates	52	41
Seamless tubes	83	71
Shot and blocks	..	31

Zinc

(Cents per lb, f.o.b. mill)

Sheet, l.c.l. 15.50
Ribbon, ton lots 14.50
Plates
Small 13.50
Large, over 12 in. 14.50

Copper, Brass, Bronze

(Cents per lb)

These prices, effective June 5, 1947, have not been adopted by all producers.

Sheets

	Base Price Per Pound
Yellow brass	29.96
Commercial bronze	33.56
Copper in rolls	32.46
Soft sheet copper	34.18

Wire and Rods

Yellow brass wire	30.25
Yellow brass (free cutting) rod	24.70
Yellow brass rod	29.65
Drawn copper rod	31.53

Seamless Tubes

Yellow Brass	32.72
Copper	34.22

Scrap Allowance

Yellow brass	15.125
Copper	19.125
Yellow brass turnings	14.25

Scrap Metals

(Dealers' buying prices, f.o.b. New York in cents per pound.)

Brass Mill Scrap

(Lots of less than 15,000 lb.)

Cartridge brass turnings 14¼
Loose yellow brass trimmings..... 15⅛

Copper and Brass

No. 1 heavy copper and wire.. 14½—15
No. 2 heavy copper and wire.. 13½—14
Light copper ..... 12½—13
Auto radiators (unsweated) 9¼—10
No. 1 composition ..... 11½—12
No. 1 composition turnings .. 11 —11½
Clean red car boxes..... 10 —10½
Cocks and faucets ..... 9¾—10
Mixed heavy yellow brass.... 7½— 8
Old rolled brass ..... 7½— 8
Brass pipe ..... 9 — 9½
New soft brass clippings.... 11½—12
Brass rod ends ..... 10½—11
No. 1 brass rod turnings .... 10 —10½

Aluminum

Alum. pistons free of struts.. 5½— 6
Aluminum crankcases ..... 5½— 6
2S aluminum clippings..... 7 — 7½
Old sheet & utensils ..... 6 — 6½
Mixed borings and turnings. 2 — 2¼
Misc. cast aluminum ..... 5½— 6
Dural clips (24S) ..... 5½— 6

Zinc

New zinc clippings ..... 6½— 7
Old zinc ..... 4½— 5
Zinc routings ..... 1½— 2
Old die cast scrap ..... 2½— 3

Nickel and Monel

Pure nickel clippings ..... 17½—18½
Clean nickel turnings ..... 15 —16
Nickel anodes ..... 17½—18½
Nickel rod ends ..... 18 —19
New Monel clippings..... 12 —12½
Clean Monel turnings ..... 7 — 7½
Old sheet Monel ..... 10 —10½
Old Monel castings ..... 8 — 8½
Inconel clippings ..... 8 — 8½
German silver clippings, mixed 8 — 8½
German silver turnings, mixed 6 — 6¼

Lead

Soft scrap lead ..... 12½—13
Battery plates (dry) ..... 7½— 7¾

Magnesium Alloys

Segregated solids 8
Castings 5

Miscellaneous

Block tin ..... 67 —68
No. 1 pewter ..... 50 —52
No. 1 auto babbitt ..... 38 —40
Mixed common babbitt ..... 11½—12
Solder joints ..... 13½—14
Siphon tops ..... 38 —39
Small foundry type ..... 14 —14½
Monotype ..... 12 —12½
Lino and stereotype ..... 11½—12
Electrotype ..... 10 —10½
New type shell cuttings .... 10½—11
Clean hand picked type shells 4½— 5
Lino and stereo dross ..... 5 — 5½
Electro dross ..... 3 — 3¼

Lead Products

(Cents per lb)

F.o.b. shipping point freight collect. Freight equalized with nearest free delivery point.

Full lead sheets 18.25
Cut lead sheets 18.75
Lead pipe, manufacturing point... 17.50
Lead traps and bends .....List +42%
Combination lead and iron bends and ferrules, also combination lead and iron ferrules ....List +42%
Lead wool 19.50

SCRAP

. . . News and Market Activities

Prices Move Higher in Most Districts

New York

• • • **Steel scrap prices** were definitely firmer in almost all major markets this week. Pittsburgh and Philadelphia reported 50¢ increases in heavy melting steel but the gains were larger elsewhere. The Buffalo average was up $2; Detroit, $2.75, and Cleveland, $3. In the Youngstown area the average No. 1 gain was $3.75; in Chicago No. 1 steel was quotable at $31 to $31.50, up an average of $1.50.

The market has had a firm undertone for several weeks in what the trade sometimes referred to as a testing of prices. The sudden climb this week may have been accentuated by the possibilities in the coal situation, according to some sources. These observers say that steel mills may have feared a continuation of the flash coal strike that early this week began costing them a considerable amount of coal. This could mean a shortage of pig iron, with increased proportions of scrap in the steel mill melt.

Cast iron grades were also firmer this week in some districts. Gains were posted in Philadelphia, Chicago and New York.

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PHILADELPHIA—Although mills have not placed current orders, the market in this district showed increasing strength last week based on broker-dealer transactions. In the face of this trend the move to establish differentials between heavy melting grades has gone overboard even on old orders, it is reported, in order to permit brokers to fill requirements. Dealers are anticipating higher prices on all grades as there is little scrap coming into yards according to reports. Brokers have reported offering over $31 for No. 2 bundles without being able to buy. The stronger market is being felt in heavy melting, turnings and cast grades.

•

NEW YORK—Prices were boosted $1 a ton in almost all grades this week as some new buying came into the market. With rising prices throughout the country brokers are scurrying to cover on old orders. The firm tone of trading indicates that prices may be forced higher before the week is out. Large tonnages are not available; if they were they would command at least an extra 50¢ in the steel scrap grades.

•

DETROIT—Although large mill buyers in this area are temporarily out of the market prices for openhearth grades jumped $2.75 this week as brokers were reported to be purchasing for delivery against orders placed by out-state buyers. The demand for low phos is also strong although little is being sold for use by Detroit consumers. Looking ahead, most buyers anticipate an increasingly tight scrap situation here, particularly if the threatened strike at Briggs is called by the UAW-CIO. Looking further into the future a work stoppage at Ford is more than a possibility. Thus far, the price of turnings is unaffected and cast iron grades continue firm.

•

PITTSBURGH—Mills profess no need for buying now but indications continue that the market is getting constantly stronger. Openhearth grades advanced 50¢ a ton this week. Some of the firmness is caused by brokers bidding against one another to fill orders and also from brokers trying to sell high priced scrap that they hold. Two larger brokers are moving into Pittsburgh to strengthen their positions here. While both have participated in the area in the past, one has opened an office here and the other is sending one of the company's key men into the area to direct its local activities. Indications of trends are often gained from the sale of railroad scrap—railroad heavy melting from a local source sold out of district at better than $36 a ton, and local sales of railroad heavy melting are at $34.50 to $35.50 a ton. Railroad specialties moved to the $42 to $43 a ton range. A sizable sale of low phos brought the market up to $38.50 to $39.50 a ton. Turnings, while not advancing in price, have become scarce. The range on these items has been reduced from $1 a ton to 50¢ a ton.

•

CHICAGO—Heavy melting steel is up here this week an average of $1.50 a ton and is quotable at $31 to $31.50 per gross ton. Railroad heavy melting steel is partly responsible for this strength as this grade is now quotable at $33.50 to $34 on the basis of recent sales. The current market here has been strengthened by higher prices being paid in almost every other district. At midweek, consumers were attempting to make purchases.

•

CLEVELAND—Hints of scrap price increases last week turned into facts this week as the price of No. 1 here and in the Valley advanced on the purchase of a representative tonnage by a major consumer. Turnings also moved up slightly, and according to sources in the trade, sympathetic increases in the prices of other grades will probably be in order, including low phos. Sale of railroad No. 1 at $36 plus, whether in district or out, has had a definite effect on the market and considerable restraint will be required if the upward spiral of scrap prices is to be halted at this time.

•

BOSTON — Last week's excitement among brokers had subsided somewhat because most steel mills apparently are not interested in scrap until the coal atmosphere clears. Despite the dearth of actual buy and sell orders, the trade is sentimentally bullish on heavy steel. In the meantime modest shipments of shoveling and machine shop turnings are accompanied by firmer prices.

•

BUFFALO — Scrap steel prices advanced $2 a ton last week on buying by one of the big consumers. Borings and turnings did not share in the rise, but low phos plate was up a similar amount and rail specialties gained $1 to $2. Other leading local mills were on the sidelines at the start of the week, apparently in no hurry to follow. Demand for cast scrap eased off still more with approach of foundry vacations. High water in the barge canal continued to hold up water shipments of openhearth shipments from the metropolitan New York area, but a 5000-ton cargo from Duluth was scheduled to arrive about the middle of the month.

•

CINCINNATI—This week the market has shown more activity than it has in weeks and prices turned higher here based on a $35 sale for No. 1 steel in the Youngstown area. The top of the openhearth grades was up $2 and all other items were advanced sharply.

•

BIRMINGHAM — A strong undertone has developed here on steel grades but prices currently are remaining stationary on all types of material. With farmers busy working crops, practically no agricultural scrap is being received at dealer's yards. Some shipyard scrap from gulf ports is moving into the immediate Birmingham area and also to northern mills.

•

ST. LOUIS—Two steel mills here came into the market with purchases totalling between an estimated 25,000 to 30,000 tons of No. 2 heavy melting at $27.50 per gross ton, which were placed with about eight dealers. The movement has been further slowed up by rains and floods in the St. Louis area plus a shortage of cars which are being assigned to coal mines for loading against a possible strike. The market is firm at unchanged prices.

•

TORONTO—Scrap iron and steel receipts in the Canadian markets are improving slowly, with most material reaching dealers being of the lighter grades that require baling before it is adaptable for steel mill use. No. 1 heavy steel making grades are scarce with no large tonnage offerings reported. However, it is learned from reliable sources that steel mills will not be seriously affected by scrap shortage as arrangements have been completed whereby a large supply will be imported from Europe over the next several months. Foundry scrap is well past the critical stage and the majority of melters in this group state that it is almost impossible to pick up cast scrap and stove plate.

IRON AND STEEL SCRAP PRICES

Going prices as obtained in the trade by THE IRON AGE, based on representative tonnages.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$32.50 to $33.00
RR. hvy. melting	34.50 to 35.00
No. 2 hvy. melting	32.50 to 33.00
RR. scrap rails	38.00 to 39.00
Rails 2 ft. and under	42.50 to 43.00
No. 1 comp'd bundles	32.50 to 33.00
Hand bdld. new shts.	32.50 to 33.00
Hvy. axle turn.	31.50 to 32.00
Hvy. steel forge turn.	31.50 to 32.00
Mach. shop turn.	27.50 to 28.00
Short shov. turn.	29.50 to 30.00
Mixed bor. and turn.	27.50 to 28.00
Cast iron borings	28.50 to 29.00
No. 1 cupola cast	36.00 to 37.00
Heavy breakable cast.	31.00 to 31.50
Malleable	48.00 to 50.00
RR. knuck and coup.	42.00 to 43.00
RR. coil springs	42.00 to 43.00
RR. leaf springs	42.00 to 43.00
Rolled steel wheels	42.00 to 43.00
Low phos	38.50 to 39.50

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$31.00 to $31.50
No. 2 hvy. melting	30.00 to 30.50
No. 1 bundles	31.00 to 31.50
No. 2 dealers' bundles	30.00 to 30.50
Bundled mach. shop turn.	30.00 to 30.50
Galv. bundles	28.00 to 28.50
Mach. shop turn.	25.00 to 25.50
Short shov. turn.	27.00 to 27.50
Cast iron borings	25.50 to 26.00
Mix. borings & turn.	25.00 to 25.50
Low phos. hvy. forge	35.00 to 36.00
Low phos. plates	33.00 to 34.50
No. 1 RR. hvy. melt.	33.50 to 34.00
Rerolling rails	37.00 to 37.75
Miscellaneous rails	35.50 to 36.00
Angles & splice bars	38.00 to 38.50
Locomotive tires, cut	39.50 to 40.00
Cut bolster & side frames	36.50 to 37.00
Standard stl. car axles	41.50 to 42.50
No. 3 steel wheels	35.00 to 35.50
Couplers & knuckles	39.00 to 40.00
Malleable	53.00 to 55.00
No. 1 mach. cast.	41.00 to 42.00
Rails 2 ft. and under	40.00 to 42.00
No. 1 agricul. cast.	39.00 to 39.50
Hvy. breakable cast.	34.00 to 34.50
RR. grate bars	34.50 to 35.00
Cast iron brake shoes	37.00 to 38.00
Cast iron carwheels	37.00 to 39.00

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$29.50 to $30.00
No. 2 hvy. melting	29.50 to 30.00
No. 1 bundles	29.50 to 30.00
No. 2 bundles	29.50 to 30.00
Mach. shop turn.	24.50 to 25.00
Shoveling turn.	26.50 to 27.00
Cast iron borings	25.50 to 26.00
Mixed bor. & turn.	24.50 to 25.00
Low phos. plate	38.50 to 39.00
No. 1 cupola cast	44.00 to 45.00
Hvy. breakable cast.	36.00 to 37.00
Scrap rails	38.00 to 39.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars:

No. 1 hvy. melting	$25.00 to $26.00
No. 2 hvy. melting	25.00 to 26.00
Nos. 1 and 2 bundles	25.00 to 26.00
Busheling	25.00 to 26.00
Turnings, shovelings	21.00 to 21.50
Machine shop turn.	19.00 to 19.50
Mixed bor. & turn.	18.50 to 19.00
Cl'n cast. chem. bor.	22.00 to 23.00
No. 1 machinery cast.	45.00 to 50.00
No. 2 Machinery cast.	45.00 to 50.00
Heavy breakable cast.	45.00 to 50.00
Stove plate	45.00 to 50.00

DETROIT

Per gross, ton, brokers' buying prices, f.o.b. cars:

No. 1 hvy. melting	$29.50 to $30.00
No. 2 hvy. melting	29.50 to 30.00
No. 1 bundles	29.50 to 30.00
New busheling	29.50 to 30.00
Flashings	29.50 to 30.00
Mach. shop turn.	21.50 to 22.00
Short shov. turn.	22.50 to 23.00
Cast iron borings	22.50 to 23.00
Mixed bor. & turn.	22.50 to 23.00
Low phos. plate	32.50 to 33.00
No. 1 Cupola cast.	35.00 to 37.00
Hvy. breakable cast.	26.00 to 28.50
Stove plate	30.00 to 32.00
Automotive cast	33.00 to 35.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$31.50 to $32.50
No. 2 hvy. melting	30.50 to 31.50
No. 1 bundles	31.50 to 32.50
No. 2 bundles	30.50 to 31.50
Mach. shop turn.	24.00 to 25.00
Shoveling turn.	24.00 to 25.00
Mixed bor. & turn.	22.00 to 23.00
Clean cast chemical bor.	29.00 to 30.00
No. 1 cupola cast.	43.00 to 44.00
Hvy. breakable cast.	42.00 to 43.00
Cast. charging box	42.00 to 43.00
Clean auto cast.	43.00 to 44.00
Hvy. axle forge turn.	31.50 to 32.50
Low phos. plate	35.00 to 36.00
Low phos. punchings	35.00 to 36.00
Low phos. bundles	34.00 to 35.00
RR. steel wheels	38.00 to 38.50
RR. coil springs	38.00 to 38.50
RR. malleable	50.00 to 52.00

ST. LOUIS

Per gross ton delivered to consumer:

No. 1 hvy. melting	$29.00 to $30.00
No. 2 hvy. melting	26.50 to 27.50
Bundled sheets	26.50 to 27.00
Mach. shop turn.	20.00 to 21.00
Locomotive tires, uncut	33.00 to 34.00
Mis. std. sec. rails	30.00 to 32.00
Rerolling rails	32.00 to 33.00
Steel angle bars	35.00 to 36.00
Rails 3 ft. and under	37.00 to 38.00
RR. steel springs	34.00 to 36.00
Steel car axles	36.00 to 37.00
Stove plate	31.00 to 32.00
Grate bars	31.00 to 32.00
Brake shoes	32.00 to 33.00
Malleable	47.00 to 49.00
Cast iron car wheels	41.00 to 42.00
No. 1 machinery cast.	36.00 to 37.00
Breakable cast	29.00 to 30.00

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$27.00
No. 2 hvy. melting	27.00
No. 2 bundles	27.00
No. 1 busheling	27.00
Long turnings	22.00
Shoveling turnings	24.00
Cast iron borings	23.00
Bar crops and plate	$29.00 to 30.00
Structural and plate	29.00 to 30.00
No. 1 cast	36.00 to 37.00
Stove plate	34.00 to 35.00
No. 1 RR hvy. melt	28.00
Steel axles	30.00 to 31.00
Scrap rails	30.00 to 31.00
Rerolling rails	32.00 to 33.00
Angles & splice bars	29.00 to 30.00
Rails 3 ft. & under	29.00 to 30.00
Cast iron carwheels	30.00 to 31.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$34.50 to $35.00
No. 2 hvy. melting	34.50 to 35.00
Low phos. plate	35.50 to 36.00
Mach. shop turn.	27.00 to 27.50
Short shov. turn.	27.50 to 28.00
Cast iron borings	27.50 to 28.00
Elec. furnace punch	35.50 to 36.00

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$26.50 to $27.00
No. 2 hvy. melting	26.50 to 27.00
No. 2 bundles	26.50 to 27.00
Comp. galv. bundles	24.50 to 25.00
Mach. shop turn.	20.00 to 20.50
Mixed bor. & turn.	20.25 to 21.25
Shoveling turn.	21.75 to 22.25
No. 1 cupola cast	35.50 to 36.50
Hvy. breakable cast.	33.50 to 34.50
Charging box cast	34.50 to 35.50
Stove plate	34.50 to 35.50
Clean auto cast.	35.50 to 36.50
Unstrip. motor blks.	31.50 to 32.50
Cl'n chem. cast bor.	22.00 to 22.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	31.00 to 32.00
No. 1 bundles	31.00 to 32.00
No. 2 bundles	31.00 to 32.00
No. 1 busheling	31.00 to 32.00
Mach. shop turn.	21.00 to 22.00
Shoveling turn.	23.00 to 24.00
Cast iron borings	21.00 to 22.00
Mixed bor. & turn.	21.00 to 22.00
No. 1 cupola cast.	35.00 to 38.00
Charging box cast	29.00 to 30.00
Stove plate	30.00 to 35.00
Clean auto cast.	35.00 to 38.00
Malleable	37.00 to 39.00
Low phos. plate	34.00 to 36.00
Scrap rails	33.00 to 36.00
Rails 3 ft & under	38.00 to 40.00
RR. steel wheels	38.00 to 40.00
Cast iron carwheels	38.00 to 40.00
RR. cail & leaf spgs.	38.00 to 40.00
RR. knuckles & coup.	38.00 to 40.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$33.50 to $34.00
No. 2 hvy. melting	33.50 to 34.00
Compressed sheet stl.	30.50 to 31.00
Drop forge flashings	30.50 to 31.00
No. 2 bundles	30.50 to 31.00
Mach. shop turn.	27.00 to 27.50
Short shovel.	27.50 to 28.00
No. 1 busheling	30.50 to 31.00
Steel axle turn.	30.50 to 31.00
Cast iron borings	27.50 to 28.00
Mixed bor. & turn.	27.00 to 27.50
No. 1 machinery cast.	40.00 to 42.00
Malleable	50.00 to 55.00
RR. cast	40.00 to 41.00
Railroad grate bars	37.00 to 38.00
Stove plate	37.00 to 38.00
RR. hvy. melting	32.00 to 32.50
Rails 3 ft. & under	41.50 to 42.00
Rails 18 in. & under	42.50 to 43.00
Elec. furnace punch.	33.00 to 33.50

SAN FRANCISCO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50
No. 2 hvy. melting	19.50
No. 2 bales	19.50
No. 3 bales	16.00
Mach. shop turn.	13.00
Elec. furn. 1 ft. und.	25.00
No. 1 cupola cast	$32.00 to 33.00
RR. hvy. melting	20.50

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50
No. 2 hvy. melting	19.50
No. 1 bales	19.50
No. 2 bales	19.50
No. 3 bales	16.00
Mach. shop turn.	14.50
No. 1 cupola cast	$35.00 to 36.00
RR. hvy. melting	20.50

SEATTLE

Per gross ton delivered to consumer:

No. 1 & No. 2 hvy. melt.	$20.00
Elec. furn. 1 ft. und.	$23.50 to 25.00
No. 1 cupola cast.	27.50 to 29.00
RR. hvy. melting	21.00

HAMILTON, ONT.

Per gross ton delivered to consumer:

Cast grades f.o.b. shipping point

Heavy melting	$17.50*
No. 1 bundles	17.50*
No. 2 bundles	17.00*
Mixed steel scrap	15.50*
Rails, remelting	18.50*
Rails, rerolling	21.50*
Bushelings	13.00*
Mixed borings & turnings	13.50*
Electric furnace bundles	20.50*
Manganese steel scrap	20.00*
No. 1 cast	19.00*
Stove plate	17.50*
Car wheels, cast	19.50*
Malleable iron	16.00*

* Ceiling price

Comparison of Prices . .

Advances over past week in Heavy Type, declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

Flat-Rolled Steel: (cents per pound)	June 10, 1947	June 3, 1947	May 13, 1947	June 11, 1946
Hot-rolled sheets	2.50	2.50	2.50	2.425
Cold-rolled sheets	3.20	3.20	3.20	3.275
Galvanized sheets (10 ga.)	3.55	3.55	3.55	4.05*
Hot-rolled strip	2.50	2.50	2.50	2.35
Cold-rolled strip	3.20	3.20	3.20	3.05
Plates	2.65	2.65	2.65	2.50
Plates, wrought iron	5.95	5.95	5.95	4.112
Stain's c-r strip (No. 302)	30.30	30.30	30.30	30.30
*24 ga				
Tin and Terneplate: (dollars per base box)				
Tinplate, standard cokes.	$5.75	$5.75	$5.75	$5.00
Tinplate, electro (0.50 lb)	5.05	5.05	5.05	4.50
Special coated mfg. ternes	4.90	4.90	4.90	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.60	2.60	2.60	2.50
Cold-finished bars	3.20	3.20	3.20	3.10
Alloy bars	3.05	3.95	3.05	2.92
Structural shapes	2.50	2.50	2.50	2.35
Stainless bars (No. 302)	26.00	26.00	26.00	25.97
Wrought iron bars	6.15	6.15	6.15	4.76
Wire and Wire Products: (cents per pound)				
Bright wire	3.30	3.30	3.30	3.05
Wire nails	3.75	3.75	3.75	3.25
Rails: (dollars per 100 lb)				
Heavy rails	$2.50	$2.50	$2.50	$43.39*
Light rails	2.85	2.85	2.85	49.18*
*per net ton				
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$42.00	$42.00	$42.00	$39.00
Sheet bars	50.00	50.00	50.00	38.00
Slabs, rerolling	42.00	42.00	42.00	39.00
Forging billets	50.00	50.00	50.00	47.00
Alloy blooms, billets, slabs	61.00	61.00	61.00	58.43
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.55	2.55	2.55	2.30
Skelp	2.35	2.35	2.35	2.05

Pig Iron: (per gross ton)	June 10, 1947	June 3, 1947	May 13, 1947	June 11, 1946
No. 2, foundry, Phila.	$36.51	$36.51	$36.51	$28.84
No. 2, Valley furnace	33.50	33.50	33.50	26.50
No. 2, Southern, Cin'ti	34.75	34.75	34.75	26.94
No. 2, Birmingham	29.88	29.88	29.88	22.88
No. 2, foundry, Chicago†	33.00	33.00	33.00	26.50
Basic, del'd eastern Pa.	36.92	36.92	36.92	27.84
Basic, Valley furnace	33.00	33.00	33.00	26.00
Malleable, Chicago†	33.50	33.50	33.50	26.50
Malleable, Valley	33.50	33.50	33.50	26.50
Charcoal, Chicago	45.99	45.99	45.99	42.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is $1 per ton.
‡ For carlots at seaboard.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh.	$32.75	$32.25	$29.75	$20.00
Heavy melt'g steel, Phila.	32.00	31.50	29.75	18.75
Heavy melt'g steel, Ch'go	31.25	29.75	29.25	18.75
No. 1, hy. comp. sheet, Det.	29.75	27.00	25.00	17.32
Low phos. plate, Youngs'n	35.75	35.75	35.75	22.50
No. 1, cast, Pittsburgh	36.50	36.50	39.50	20.00
No 1, cast, Philadelphia	43.50	42.50	41.00	20.00
No. 1, cast, Chicago	41.50	39.75	37.25	20.00
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$10.50	$10.50	$10.50	$7.50
Foundry coke, prompt	11.25	11.25	11.25	9.00
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	*21.50*	22.00	23.00	14.375
Copper, Lake, Conn.	21.625	21.625	21.625	14.375
Tin, Straits, New York	80.00	80.00	80.00	52.00
Zinc, East St. Louis	10.50	10.50	10.50	8.25
Lead, St. Louis	14.80	14.80	14.80	8.10
Aluminum, virgin	15.00	15.00	15.00	15.00
Nickel, electrolytic	37.67	37.67	37.67	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	33.00	33.00	33.00	14.50

Composite Prices . .

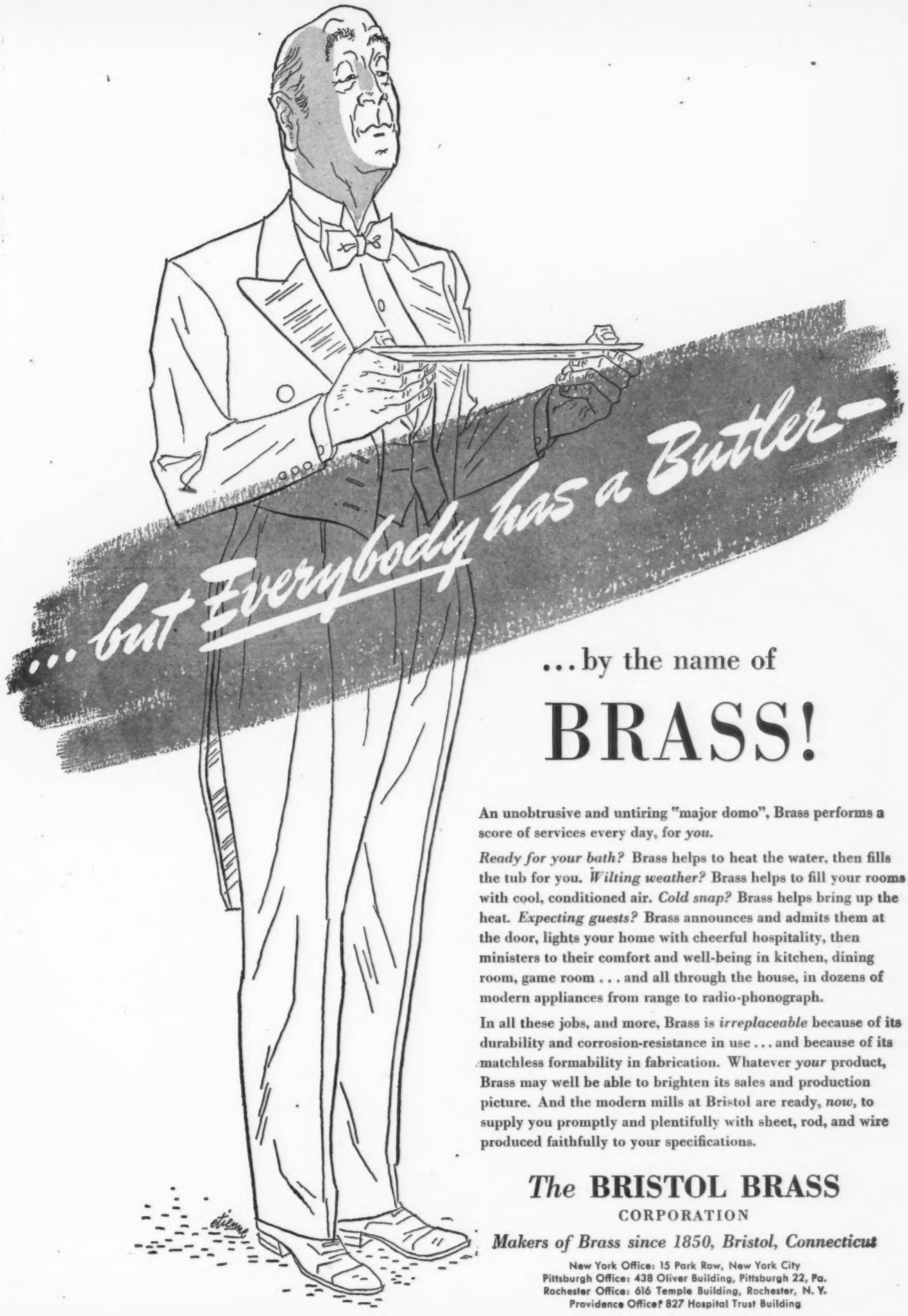
Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943, issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite price for the current quarter is an estimate based on finished steel shipments for the previous quarter. This figure will be revised when the actual data of shipments for this quarter are compiled.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 10, 1947	2.85664¢ per lb.	$33.15 per gross ton	$32.00 per gross ton
One week ago	2.85664¢ per lb.	$33.15 per gross ton	$31.17 per gross ton
One month ago	2.85664¢ per lb.	$33.15 per gross ton	$29.58 per gross ton
One year ago	2.73011¢ per lb.	$26.12 per gross ton	$19.17 per gross ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1947	2.85664¢	2.85664¢	$33.15 Mar. 11	$30.14 Jan. 7	$39.67 Mar. 18	$29.50 May 20
1946	2.83599¢ Dec. 31	2.54490¢ Jan. 1	30.14 Dec. 10	25.37 Jan. 1	31.17 Dec. 24	19.17 Jan. 1
1945	2.44104¢ Oct. 2	2.38444¢ Jan. 2	25.37 Oct. 23	23.61 Jan. 2	19.17 Jan. 2	18.92 May 22
1944	2.30837¢ Sept. 5	2.21189¢ Oct. 5	$23.61	$23.61	19.17 Jan. 11	15.76 Oct. 24
1943	2.29176¢	2.29176¢	23.61	23.61	$19.17	$19.17
1942	2.28249¢	2.28249¢	23.61	23.61	19.17	19.17
1941	2.43078¢	2.43078¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 9
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 8
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1.83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan. 7	1.97319¢ Dec. 9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 8

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 66 pct of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

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Iron and Steel Prices . . .

Steel prices shown here are f.o.b basing points in cents per pound or dollars per gross ton. Extras apply. Delivered prices do not reflect 3 pct tax on freight. Industry practice has discontinued arbitrary f.o.b. prices at Gulf and Pacific Ports. Space limitations prevent quotation of delivered prices at major ports. (1) Commercial quality sheet grade; primes, 25c above base. (2) Commercial quality grade. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. (8) Also shafting. For quantities of 20,000 lb to 89,999 lb. (9) Carload lot in manufacturing trade. (10) This base price for annealed, bright finish wire, commercial spring wire. (11) Boxed. (12) Produced to dimensional tolerances in AISI Manual Sec. 6 (13) Delivered San Francisco only: Includes 3 pct freight tax. (14) Delivered Kaiser Co. prices; includes 3 pct freight tax. (15) 0.035 to 0.075 in. thick by ¾ to 3½ in. wide. (16) Some sales are at higher prices. (17) Delivered Los Angeles; add ½c per 100 lb for San Francisco. (18) Delivered Los Angeles only.

Basing Points	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio		San Francisco, Los Angeles, Seattle	DELIVERED TO Detroit	New York	Philadelphia
INGOTS															
Carbon, rerolling	($35.00 f. o. b. mill)														
Carbon, forging	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00								
Alloy	$52.00						Canton—$52.00)								
BILLETS, BLOOMS, SLABS															
Carbon, rerolling	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00	(Provo—$53.20) $42.00	$42.00					$45.00		
Carbon, forging billets	$50.00	$50.00	$50.00	$50.00	$50.00	$50.00	(Provo—$61.20, Duluth—$52.00[13]) $50.00						$53.00		
Alloy	$61.00	$61.00				$61.00	(Bethlehem, Massillon, Canton—$61.00)						$64.00		
SHEET BARS							$53.00		Portsmouth, Ohio—$67.20						
PIPE SKELP	2.35¢	2.35¢					2.35¢	2.35¢	(Coatesville—2.35¢)						
WIRE RODS	2.55¢	2.55¢		2.55¢	2.55¢		(Worcester—2.65¢)					3.27¢[13]			
SHEETS															
Hot-rolled	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.875¢	2.50¢		3.24¢[17]	2.65¢	2.79¢	2.70¢
Cold-rolled [1]	3.20¢	3.20¢	3.20¢	3.20¢		3.20¢	3.20¢		3.30¢				3.35¢	3.61¢	3.58¢
Galvanized (10 gage)	3.55¢	3.55¢	3.55¢		3.55¢		3.55¢	3.55¢	3.65¢			4.32¢[17]		3.84¢	3.75¢
Enameling (12 gage)	3.55¢	3.55¢	3.55¢	3.55¢			3.55¢		3.65¢				3.70¢	3.95¢	3.93¢
Long ternes [2] (10 gage)	3.55¢	3.55¢	3.55¢											3.95¢	3.91¢
STRIP															
Hot-rolled [3]	2.50¢	2.50¢	2.50¢	2.50¢[15]	2.50¢		2.50¢						2.65¢	2.93¢	2.88¢
Cold-rolled [4]	3.20¢	3.30¢		3.20¢			3.20¢			(Worcester—3.40¢)			3.35¢	3.61¢	3.58¢
Cooperage stock	2.80¢	2.80¢			2.80¢		2.80¢							3.09¢	
TINPLATE															
Standard cokes, base box	$5.75	$5.75	$5.75		$5.85			$5.85	$5.85		(Warren, Ohio—$5.75)			$6.157	$6.062[11]
Electro, box { 0.25 lb.	Deduct 90¢ from standard coke base box price.														
Electro, box { 0.50 lb.	Deduct 70¢ from standard coke base box price.														
Electro, box { 0.75 lb.	Deduct 50¢ from standard coke base box price.														
BLACKPLATE, 29 gage [5]	3.60¢	3.60¢	3.60¢		3.70¢			3.70¢	3.70¢		(Warren, Ohio—$5.75)			3.99¢	3.90¢
BLACKPLATE, CANMAKING															
55 lb. to 70 lb.	Deduct $1.55 from standard coke base box.														
75 lb. to 95 lb.	Deduct $1.65 from standard coke base box.														
100 lb. to 118 lb.	Deduct $1.55 from standard coke base box.														
TERNES, MFG., Special coated	Deduct 85¢ from standard coke base box price.														
BARS															
Carbon steel	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢					3.285¢	2.75¢	3.01¢	2.98¢
Rail steel [6, 16]	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢									
Reinforcing (billet) [7]	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢				2.985¢		2.74¢	2.65¢
Reinforcing (rail) [7, 16]	2.95¢	2.95¢	2.95¢	2.95¢	2.95¢	2.95¢	2.95¢								
Cold-finished [8]	3.20¢	3.20¢	3.20¢	3.20¢		3.20¢							3.35¢	3.61¢	3.58¢
Alloy, hot-rolled	3.05¢	3.05¢				3.05¢	3.05¢	(Bethlehem, Massillon, Canton—3.05¢)					3.20¢		3.19¢
Alloy, cold-drawn	3.80¢	3.80¢	3.80¢	3.80¢		3.80¢							3.95¢		
PLATE															
Carbon steel [12]	2.65¢	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢	(Coatesville, Claymont—2.80¢, Geneva, Utah—2.80¢) 2.65¢				3.46¢[14]		2.87¢	2.85¢
Floor plates	3.90¢	3.90¢												4.30¢	4.28¢
Alloy	3.79¢	3.79¢			(Coatesville—4.10¢)									4.01¢	3.895¢
SHAPES, Structural	2.50¢	2.50¢	2.50¢		2.50¢	2.50¢	(Geneva, Utah—2.65¢) (Bethlehem—2.50¢)					3.17¢[13]		2.70¢	2.64¢
SPRING STEEL, C-R															
0.26 to 0.40 carbon	3.20¢			3.20¢			(Worcester—3.40¢)								
0.41 to 0.60 carbon	4.70¢			4.70¢			(Worcester—4.90¢)								
0.61 to 0.80 carbon	5.30¢			5.30¢			(Worcester—5.50¢)								
0.81 to 1.00 carbon	6.80¢			6.80¢			(Worcester—7.00¢)								
Over 1.00 carbon	9.10¢			9.10¢			(Worcester—9.30¢)								
MANUFACTURERS' WIRE [9]															
Bright [10]	3.30¢	3.30¢		3.30¢	3.30¢		(Worcester—3.40¢, Duluth—3.35¢)					5.63¢[13]		3.71¢	3.68¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire Base														
Spring (high carbon)	4.25¢	4.25¢		4.25¢			(Worcester—4.35¢, Duluth—4.50¢)			(Trenton—4.50¢)		5.24¢[13]		4.66¢	4.595¢
PILING, Steel sheet	3.00¢	3.00¢				3.00¢								3.41¢	3.38¢

CORROSION AND HEAT RESISTANT STEELS

In cents per pound, f.o.b. basing point

Basing Point	Chromium Nickel		Straight Chromium			
	No. 304	No. 302	No. 410	No. 430	No. 442	No. 446
Ingot, P'gh, Chi, Canton, Balt, Reading, Ft. Wayne, Phila.	Subject to negotiation			Subject to negotiation		
Blooms, P'gh, Chi, Canton, Phila, Reading, Ft. Wayne, Balt.	22.99	24.67	17.01	17.47	20.69	25.29
Slabs, P'gh, Chi, Canton, Balt, Phila, Reading	22.99	24.67	17.01	17.47	20.69	25.29
Billets, P'gh, Chi, Canton, Watervliet, Syracuse, Balt.	Subject to negotiation			Subject to negotiation		
Billets, forging, P'gh, Chi, Canton, Dunkirk, Balt, Phila, Reading, Water, Syracuse, Ft. Wayne, Titusville	23.00	22.50	17.50	17.50	21.00	25.50
Bars, h-r, P'gh, Chi, Canton, Dunkirk, Watervliet, Syracuse, Balt, Phila, Reading, Ft. Wayne, Titusville	27.50	26.00	20.50	21.00	24.50	30.00
Bars, c-f, P'gh, Chi, Cleve, Canton, Dunkirk, Syracuse, Balt, Phila, Reading, Ft. Wayne, Watervliet	27.50	26.00	20.50	21.00	24.50	30.00
Plates, P'gh, Middletown, Canton	31.50	29.50	23.50	24.00	28.00	33.00
Shapes, structural, P'gh, Chi	27.50	26.00	20.50	21.00	24.50	30.00
Sheets, P'gh, Chi, Middletown, Canton, Balt.	39.00	37.00	29.00	31.50	35.50	39.50
Strip, h-r, P'gh, Chi, Reading, Canton, Youngstown	25.50	23.50	18.50	19.00	26.00	38.00
Strip, c-r, P'gh, Cleve, Newark, N. J., Reading, Canton, Youngstown	32.50	30.50	24.00	24.50	35.00	56.50
Wire, c-d, Cleve, Dunkirk, Syracuse, Balt, Reading, Canton, P'gh, Newark, N. J. Phila., Ft. Wayne	27.50	26.00	20.50	21.00	24.50	30.00
Wire, flat, c-r, Cleve, Balt, Reading, Dunkirk, Canton	32.46	30.30	23.80	24.34	34.62	56.26
Rod, h-r, Syracuse	27.05	25.97	20.02	20.56	24.34	29.75
Tubing, seamless, P'gh, Chi, Canton, (4 to 8 in.)	72.09	72.09	.....	68.49	.....	.....

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse, Dunkirk. •Also Canton, Ohio)

W	Cr	V	Mo		Base per lb
18	4	1	—	.....	74¢
1.5	4	1.5	8	.....	59¢
6	4	2	6	.....	63¢
High-carbon-chromium•				.....	47¢
Oil hardening manganese•				.....	26¢
Special carbon•				.....	24¢
Extra carbon•				.....	20¢
Regular carbon•				.....	16¢

Warehouse prices on and east of Mississippi are 2¢ per lb. higher; west of Mississippi, 4¢ higher.

ELECTRICAL SHEETS

Base, all grades f.o.b. Pittsburgh

	Per lb
Field grade	4.20¢
Armature	4.50¢
Electrical	5.00¢
Motor	5.75¢
Dynamo	6.45¢
Transformer 72	6.95¢
Transformer 65	7.65¢
Transformer 58	8.35¢
Transformer 52	9.15¢

F.o.b. Chicago and Gary, field grade through motor; f.o.b. Granite City, add 10¢ per 100 lb on field grade to and including dynamo.

RAILS, TRACK SUPPLIES

(F.o.b. mill)

Standard rails, heavier than 60 lb	
No. 1 O.H., per 100 lb	$2.50
Angle splice bars, 100 lb	3.00
(F.o.b. basing points)	*per 100 lb*
Light rails (from billets)	$2.85
Light rails (from rail steel), f.o.b. Williamsport, Pa.	2.95

	Base per lb
Cut spikes	4.50¢
Screw spikes	6.40¢
Tie plate, steel	2.80¢
Tie plates, Pacific Coast	2.95¢
Track bolts	6.50¢
Track bolts, heat treated, to rail roads	6.75¢
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond.

ROOFING TERNEPLATE

(F.o.b. Pittsburgh, 112 sheets)

	20x14 in.	20x28 in.
8-lb coating I.C.	$6.75	$13.50

CLAD STEEL

Base prices, cents per pound

Stainless-clad	Plate	Sheet
No. 304, 20 pct, f.o.b. Pittsburgh, Washington, Coatesville, Pa.	•24.00	•22.00
Nickel-clad 10 pct, f.o.b. Coatesville, Pa.	21.50	....
Inconel-clad 10 pct, f.o.b. Coatesville	30.00	....
Monel-clad 10 pct, f.o.b. Coatesville	29.00	....
Aluminized steel Hot dip, 20 gage, f.o.b. Pittsburgh	....	9.00

•Includes annealing and pickling, or sandblasting.

MERCHANT WIRE PRODUCTS

To the dealer f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Base per keg	Delivered San Francisco
Standard, galvanized and coated nails	$3.75†	$4.83
Cut nails, carloads, Pittsburgh base	5.30	....

†10¢ additional at Cleveland, 30¢ at Worcester.

	Base per 100 lb	
Annealed fence wire	$3.95‡	$4.96
Annealed galv. fence wire	4.40‡	5.41

‡10¢ additional at Worcester.

To the dealer f.o.b. Pittsburgh, Chicago, Birmingham

	Base column	
Woven wire fence•	84	107
Fence posts, carloads	90††	...
Single loop bale ties	86	110
Galvanized barbed wire••	94	114
Twisted barbless wire	94	...

• 15½ gage and heavier. •• On 80-rod spools in carload quantities. †† Pittsburgh, Duluth.

HIGH STRENGTH, LOW ALLOY STEELS

base prices, cents per pound

Steel	Alde-cor	Corten	Double Strength No. 1	Dyn-alloy	HI Steel	Mayari R	Otis-coloy	Yoloy	Y-50	NAX High Tensile
Producer	Republic	Carnegie-Illinois Republic	Republic	Alan Wood	Inland	Bethlehem	Jones & Laughlin	Youngstown Sheet & Tube	American Rolling Mill	Great Lakes Steel
Plates	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	....	4.10
Sheets										
Hot-rolled	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	....	3.85
Cold-rolled	4.75	4.75	4.75	....	4.75	4.75	4.75	4.75	5.225•	4.75
Galvanized	....	5.40	...	....	....	5.40	....	....	....	....
Strip										
Hot-rolled	3.85	3.85	3.85	...	3.85	3.85	3.85	3.85	....	3.85
Cold-rolled	....	....	4.75	....	....	4.75	4.75	4.75	5.00•	4.75†
Shapes	....	3.85	....	....	3.85	3.85	3.85	3.85	....	....
Beams	....	3.85	....	....	....	3.85	....	....	....	....
Bars										
Hot-rolled	4.00	4.00	4.00	....	....	4.00	4.00	4.00	....	4.00
Cold-rolled	....	....	....	....	....	....	....	4.60	....	....
Bar shapes	....	4.00	....	....	4.00	4.00	4.00	4.00	....	....

• 21 gage and lighter. † Pittsburgh, add 0.10¢ at Chicago and Gary.

PIPE AND TUBING

Base discounts. F.o.b. Pittsburgh and Lorain, steel buttweld and seamless. Others f.o.b. Pittsburgh only

Base price, $200.00 per net ton

Standard, threaded & coupled

Steel, buttweld	Black	Galv.
⅛-in.	55½	41
¼-in.	58½	45
1 to 3-in.	60½	47½
Wrought Iron, buttweld		
⅛ in.	2	+20
¼-in.	11½	+10
1 and 1¼-in.	17	+ 2
1½-in.	22½	1½
2-in.	23	2
Steel, lapweld		
2-in.	53	39½
2½ and 3-in.	56	42½
3½ to 6-in.	58	44½
Steel, seamless		
2-in.	52	38½
2½ and 3-in.	55	41½
3½ to 6-in.	57	43½
Wrought Iron, lapweld		
2-in.	14½	+ 5½
2½ to 3½-in.	17	+ 1½
4-in.	21	4
4½ to 8-in.	19	2½

Extra Strong, plain ends

Steel, buttweld		
⅛-in.	54½	41½
¼-in.	58½	45½
1 to 3-in.	60	48
Wrought Iron, buttweld		
⅛-in.	6½	+14
¼-in.	12½	+ 8
1 to 2-in.	22	2
Steel, lapweld		
2-in.	52	39½
2½ and 3-in.	56	43½
3½ to 6-in.	59½	47
Steel, seamless		
2-in.	51	38½
2½ and 3-in.	55	42½
3½ to 6-in.	58½	46
Wrought Iron, lapweld		
2-in.	17½	+ 2
2½ to 4-in.	26	8½
4½ to 6-in.	22	4

Basing discounts for standard pipe are for threads and couplings. For threads only, buttweld, lapweld and seamless pipe, one point higher discount (lower price) applies. For plain ends, buttweld, lapweld and seamless pipe 3-in. and smaller, three points higher discount (lower price) applies, while for lapweld and seamless 3½-in. and larger four points higher discount (lower price) applies. F.o.b. Gary prices are one point lower discount on all buttweld. On buttweld and lapweld steel pipe, jobbers are granted a discount of 5 pct. On l.c.l. shipments, prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

BOILER TUBES

Seamless steel and electric welded commercial boiler tubes and locomotive tubes, minimum wall. Net base prices per 100 ft, f.o.b. Pittsburgh in carload lots, cut length 4 to 24 ft, inclusive.

O.D. in.	Gage BWG	Seamless Hot-Rolled	Seamless Cold-Drawn	Electric Weld Hot-Rolled	Electric Weld Cold-Drawn
2	13	$15.29	$18.17	$15.00	$17.95
2½	12	20.57	24.43	20.11	24.07
3	12	22.87	27.18	22.26	26.68
3½	11	28.86	34.30	28.06	33.64
4	10	35.82	42.55	34.78	41.68

CAST IRON WATER PIPE

	Per net ton
6-in. to 24-in. del'd Chicago	$81.56
6-in. to 24-in. del'd New York	79.80
6-in. to 24-in., Birmingham	71.00
6-in. and larger, f.o.b. cars, San Francisco, Los Angeles for all rail shipment; rail and water shipment less	95.00

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts

Base discount less case lots

	Percent Off List
½ in. & smaller x 6 in. & shorter	55
Over 6 in.	45
9/16 & ⅝ in. x 6 in. & shorter	52
9/16 through 1 in, x over 6 in.	48
⅞ & 1 in. x in. and shorter	51
⅝ in. x 6 in. & shorter	49
1⅛ in. and larger, all lengths	48
Lag, all diam over 6 in. long	48
Lag, all diam x 6 in. & shorter	50
Plow bolts	57

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	48
9/16 to 1 in. inclusive	47
1⅛ to 1½ in. inclusive	45
1⅝ in. and larger	44

On above bolts and nuts, excepting plow bolts, additional allowance of 15 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

Semifin. Hexagon Nuts

Base discount less case lots

	U.S.S.	S.A.E.
7/16 in. and smaller	..	51
½ in. and smaller	48	..
½ in. through 1 in.	..	48
9/16 in. through 1 in.	47	..
1⅛ in. through 1½ in.	45	46
1⅝ in. and larger	44	..

In full case lots, 15 pct additional discount. For 200 lb or more, freight allowed up to 50¢ per 100 lb, based on Cleveland, Chicago, Pittsburgh.

Stove Bolts

	Consumer
Packages, nuts separate	60 and 10
In bulk	74

On stove bolts freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago, New York on lots of 200 lb or over.

Large Rivets (½ in. and larger)

	Base per 100 Lb
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$5.25
F.o.b. Lebanon, Pa.	5.40

Small Rivets (7/16 in. and smaller)

	Percent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	55 and 5

Cap and Set Screws

(In packages)	Percent Off List Consumer
Hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in., SAE 1020, bright	56
¾ to 1 in. x 6 in., SAE 1035, heat treated	47
Set screws, cup and oval points	61
Milled studs	33
Flat head cap screws, listed sizes	21
Fillister head cap, listed sizes	40

Freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago or New York on lots of 200 lb or over.

FLUORSPAR

Metallurgical grade, f.o.b. producing plant.

Effective CaF_2 Content:	Base price per short ton
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports)

	Per Gross Ton
Old range, bessemer	$5.95
Old range, non-bessemer	5.80
Mesabi, bessemer	5.70
Mesabi, non-bessemer	5.55
High phosphorus	5.55

Prices quoted retroactive to Jan. 1, 1947.

METAL POWDERS

Prices in cents per pound in ton lots, f.o.b. shipping point.

Brass, minus 100 mesh	23¢ to 27¢
Copper, electrolytic, 100 and 325 mesh	30¢ to 31½¢
Copper, reduced, 150 and 200 mesh	29¢ to 30½¢
Iron, commercial, 100, 200, 325, mesh 96 + % Fe	11¢ to 16¢
Swedish sponge iron, 100 mesh, c.i.f. N. Y., carlots, ocean bags	7.4¢ to 8.5¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots	5¢
Iron, hydrogen reduced, 300 mesh and finer, 98 + % Fe, drum lots	66¢
Iron, electrolytic, unannealed, 325 mesh and coarser, 99 + % Fe	25¢ to 31¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	17¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90¢ to $1.75
Aluminum, 100, 200 mesh, carlots	23¢ to 26¢
Antimony, 100 mesh	36.05¢
Cadmium, 100 mesh	$2.00
Chromium, 100 mesh and finer	$1.025
Lead, 100, 200 & 300 mesh	18.50¢ to 23.50¢
Manganese, minus 325 mesh and coarser	33¢
Nickel, 150 mesh	51½¢
Silicon, 100 mesh	18.15¢
Solder powder, 100 mesh	8½¢ plus metal
Tin, 100 mesh	90¢
Tungsten metal powder, 98%-99%, any quantity, per lb	$2.90
Molybdenum powder, 99%, in 100-lb kegs, f.o.b. York, Pa., per lb	$2.65
Under 100 lb	$2.90

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$10.00 to $11.00
Foundry, beehive (f.o.b. oven)	
Connellsville, Pa.	11.00 to 12.00
Foundry, Byproduct	
Chicago, del'd	$16.10
Chicago, f.o.b.	15.10
New England, del'd	17.25
Seaboard, Kearney, N. J., f.o.b.	15.35
Philadelphia, del'd	15.46
Buffalo, del'd	16.14
Ashland, Ohio, f.o.b.	13.35
Painesville, Ohio, f.o.b.	14.60
Erie, del'd	15.75
Cleveland, del'd	15.90
Cincinnati, del'd	15.39
St. Louis, del'd	15.85
Birmingham, del'd	13.25

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Carloads, Per 1000
First quality, Ohio	$64.00
First quality, Pa., Md., Ky., Mo.	70.00
First quality, New Jersey	75.00
Sec. quality, Pa., Md., Ky., Mo.	64.00
Sec. quality, New Jersey	59.00
Sec. quality, Ohio	56.00
Ground fire clay, net ton, bulk	10.00

Silica Brick

Pennsylvania and Birmingham	$70.00
Chicago District	79.00
Silica cement, net ton (Eastern)	12.00
East Chicago	13.00

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$59.00

Magnesite Brick

Standard, Balt. and Chester	$81.00
Chemically bonded, Baltimore	70.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in bulk	$44.50
Domestic, f.o.b. Chewelah, Wash., in bulk	24.00
in sacks	28.00
Clinker (dead burned) dolomite, bulk, per net ton, f.o.b. Billmeyer, Pa., Millersville, O.	10.55

Midwest, add 10¢; Mo. Valley, add 20¢

WAREHOUSE PRICES

Base prices, delivered metropolitan areas, per 100 lb.

CITIES	SHEETS			STRIP				BARS		ALLOY BARS			
	Hot-Rolled	Cold-Rolled	Galvanized (10 gage)	Hot-Rolled	Cold-Rolled	Plates	Standard Structural Shapes	Hot-Rolled	Cold-Finished	Hot-Rolled, A 4615 As-rolled	Hot-Rolled, A 4140-50 Ann.	Cold-Drawn, A 4615 As-rolled	Cold-Drawn, A 4140-50 Ann.
Philadelphia	$4.14	$5.18	$5.29	$4.43	$5.28	$4.44	$4.22	$4.48	$5.13	$8.37	$8.37	$9.88	$9.88
New York	4.22	5.17[1]	5.47	4.62	5.40	4.62	4.37	4.62	5.17	8.42	8.42	9.92	9.92
Boston	4.40	5.22	4.95[12]	4.65	6.36	4.70	4.47	4.62	5.22	8.62	8.62	9.97	9.97
Baltimore	3.89	....	5.14	4.40	....	4.39	4.34	4.45	5.10	....	....	....	....
Norfolk	4.15	....	....	....	....	4.50	4.50	4.75	5.50	....	....	....	....
Chicago	3.65	....	....	4.05	5.05	4.25	4.10	4.10	4.75	8.10	8.10	9.35	9.35
Milwaukee	4.099	4.899[1]	5.249	4.199	....	4.399	4.249	4.249	4.899	8.399	8.399	9.649	9.649
Cleveland	3.95	4.55	5.238	4.188	5.00	4.25†	4.311	4.10	4.75	8.358	8.358	9.35	9.35
Buffalo	3.95	4.65[1]	5.35	4.30	5.25	4.55	4.10	4.10	4.75	8.10	8.10	9.35	9.35
Detroit	4.05	4.85	5.42	4.34	5.24	4.49†	4.42	4.20	4.87	8.51	8.51	9.74	9.74
Cincinnati	3.916	4.716	5.166	....	....	4.553	4.444	4.403	5.053	....	....	....	....
St. Louis	3.999	4.799[1]	5.424	4.199	5.424*	4.399	4.249	4.249	5.074	8.574	8.574	9.824	9.824
Pittsburgh	3.95	4.65[1]	5.10	4.05	4.95	4.25	4.10	4.10	4.75	8.10	8.10	9.35	9.35
St. Paul	4.184[7]	4.984[1]	5.434[2]	4.384[7]	....	4.584[7]	4.434[7]	4.434[7]	5.476[6]	....	....	....	....
Omaha	4.668	6.118[1]	5.918	4.868	....	5.068	4.918	4.918	5.818	....	....	....	....
Indianapolis	3.84	4.84	5.29	4.24	5.01	4.51	4.36	4.56	5.01	....	....	....	....
Birmingham	3.65[11]	....	5.20	4.00[11]	....	4.30[11]	4.05[11]	4.05[11]	5.58	....	....	....	....
Memphis	4.27	....	5.97	4.72	....	4.92	4.67	4.67	5.78	....	....	....	....
New Orleans	*4.26[11]	5.77[1]	....	....	....	4.83[11]	*4.68[11]	*4.78[11]	6.14	....	....	....	....
Los Angeles	5.15	7.00[1]	6.70	5.65	8.35[5]	5.10	5.20	5.10	6.90[14]	10.15	9.35	11.05	11.05
San Francisco	4.70[8]	6.30[9]	6.45	5.20[8]	....	5.00[8]	4.90[8]	4.75[8]	7.00[10]	....	....	....	....
Seattle	4.80[4]	6.75[2]	6.30	5.30[4]	....	5.15[4]	4.95[4]	5.00[4]	7.10[14]	....	9.50[6]	....	10.85[6]
Portland	5.00[4]	....	6.25	5.50[4]	....	5.25[4]	5.10[4]	5.10[4]	7.20	....	9.30[6]	....	....
Salt Lake City	5.65	....	7.10	6.35	....	5.70	5.85	5.95	7.00	....	....	....	....

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT-ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD-ROLLED: Sheets, 400 to 1999 lb; strip, extras on all quantities; bars 1000 lb and over.

ALLOY BARS: 1000 lb and over.

GALVANIZED SHEETS: 450 to 1499 lb.

EXCEPTIONS: (1) 400 to 1499 lb; (2) 450 to 1499 lb; (3) 300 to 4999 lb; (4) 300 to 9999 lb; (5) 2000 lb and over; (6) 1000 lb and over; (7) 400 to 14,999; (8) 400 lb and over; (9) 450 to 1499; (10) 500 to 999; (11) 400 to 3999; (12) 450 to 3749; (13) 400 to 1999; (14) 1500 and over.

* Add 46¢ for sizes not rolled in Birmingham.

† Up to ¾ in. thick and 90 in. wide.

PIG IRON PRICES

Dollars per gross ton. Delivered prices represent minimums.

BASING POINT PRICES						DELIVERED PRICES (BASE GRADES)						
Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.	Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	34.00	34.50	35.00	35.50	.....	Boston	Everett	$0.50 Arb.	29.50	30.00	30.50	31.00	.....
Birdsboro	34.00	34.50	35.00	35.50	39.00	Boston	Birdsboro-Steelton	4.82	.....	.....	.....	.....	43.82
Birmingham	29.38	29.68	.....	.....	.....	Brooklyn	Bethlehem	3.00	37.00	37.50	38.00	38.50	.....
Buffalo	32.50	33.00	33.50	.....	.....	Brooklyn	Birdsboro	3.50	.....	.....	.....	.....	42.50
Chicago	32.50	33.00	33.50	34.00	.....	Cincinnati	Birmingham	4.87	34.25	34.75	.....	.....	.....
Cleveland	32.50	33.00	33.50	.....	.....	Jersey City	Bethlehem	1.84	35.84	36.34	36.84	37.34	.....
Duluth	33.00	33.50	34.00	34.50	.....	Jersey City	Birdsboro	2.33	.....	.....	.....	.....	41.33
Erie	32.50	33.00	33.50	34.00	.....	Los Angeles	Provo	5.94	38.94	39.44	.....	.....	.....
Everett	29.00	29.50	30.00	30.50	.....	Mansfield	Cleveland-Toledo	2.33	34.83	35.33	35.83	36.33	.....
Granite City	32.50	33.50	33.50	.....	.....	Philadelphia	Swedeland	1.01	6.01	36.51	37.01	37.51	.....
Neville Island	33.00	33.50	33.50	34.00	.....	Philadelphia	Birdsboro	1.49	.....	.....	.....	.....	40.49
Provo	33.00	33.50	.....	.....	.....	San Francisco	Provo	5.94	38.94	39.44	.....	.....	.....
Sharpsville	33.00	33.50	33.50	34.00	.....	Seattle	Provo	5.94	38.94	39.44	.....	.....	.....
Steelton	34.00	.....	.....	.....	39.00	St. Louis	Granite City	0.75 Arb.	34.25	34.25	34.25	.....	.....
Struthers, Ohio	33.50	.....	.....	.....	.....								
Swedeland	35.00	35.50	36.00	36.50	.....								
Toledo	32.50	33.00	33.50	34.00	.....								
Troy, N. Y.	34.00	34.50	35.00	35.50	39.00								
Youngstown	33.00	33.50	33.50	34.00	.....								

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50¢ per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct); phosphorus differentials, a reduction of 38¢ per ton for phosphorus content of 0.70 pct and over; manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron silicon 6.00 to 6.50 pct, C/L per g.t., f.o.b. Jackson, Ohio—$42.50; f.o.b. Buffalo—$43.75. Add $1.00 per ton for each additional 0.50 pct Si, up to 12 pct. Add 50¢ per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for 0.75 pct or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

Charcoal pig iron base price for low phosphorous $40.50 per gross ton, f.o.b. Lyles, Tenn. Delivered to Chicago, $45.99. High phosphorous charcoal pig iron is not being produced.

Ferromanganese

78-82% Mn, maximum contract base price, gross ton, lump size, f.o.b. Baltimore, Philadelphia, New York, Birmingham, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Less ton lots (packed)	157.00
Delivered Pittsburgh	140.25

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Briquets—cents per pound of briquet, freight allowed, 66% contained Mn.

	Eastern	Central	Western
Carload, bulk	7.00	7.25	7.80
Ton lots	8.00	8.60	10.50
Less ton lots	8.40	9.00	10.90

Spiegeleisen

Contract prices, gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$43.00	$44.00
F.o.b. Pittsburgh	47.00	48.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, f.o.b. shipping point, freight allowed, eastern zone.

96% min. Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	30
L.c.l. lots	32

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	32
Ton lots	34
Less ton lots	36

Low-Carbon Ferromanganese

Contract price, cents per pound Mn contained, lump size, f.o.b. shipping point, freight allowed, eastern zone.

	Carloads	Ton	Less
0.06% max. C, 0.06% P, 90% Mn	21.00	22.10	22.70
0.10% max. C	20.50	21.60	22.20
0.15% max. C	20.00	21.10	21.70
0.30% max. C	19.50	20.60	21.20
0.50% max. C	19.00	20.10	20.70
0.75% max. C, 7.00% max. Si	16.00	17.10	17.70

Silicomanganese

Contract basis, lump size, cents per pound of metal, f.o.b. shipping point, freight allowed, 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.65
Ton lots	7.70
Briquet, contract basis, carlots, bulk freight allowed, per lb of briquet	6.75
Ton lots	7.75
Less ton lots	8.15

Silvery Iron (electric furnace)

Si 14.01 to 14.50%, $68.00 f.o.b. Keokuk, Iowa; $67.00 f.o.b. Niagara Falls. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add 50¢ per ton for each 0.50 pct Mn over 1 pct.

Silicon Metal

Contract price, cents per pound contained Si, lump size, f.o.b. shipping point, freight allowed, for ton lots packed.

	Eastern	Central	Western
96% Si, 2% Fe	15.60	17.85	19.60
97% Si, 1% Fe	16.00	18.25	20.00

Ferrosilicon Briquets

Contract price, cents per pound of briquet, bulk, f.o.b. shipping point, freight allowed to destination, 40% Si. 1 lb Si briquets.

	Eastern	Central	Western
Carload, bulk	4.25	4.50	4.70
Ton lots	5.25	5.85	6.15
Less ton lots	5.65	6.25	6.55

Electric Ferrosilicon

Contract price, cents per pound contained Si, lump size in carloads, f.o.b. shipping point, freight allowed.

	Eastern	Central	Western
25% Si	11.65	...	...
50% Si	7.80	8.30	8.50
75% Si	10.00	10.30	11.05
80-90% Si	11.30	11.60	12.35
90-95% Si	12.80	13.10	13.80

Ferrochrome (65-72% *Cr, 2% max. Si*)

Contract prices, cents per pound, contained Cr, lump size in carloads, f.o.b. shipping point, freight allowed.

	Eastern	Central	Western
0.06% C	23.00	23.40	24.00
0.10% C	22.50	22.90	23.50
0.15% C	22.00	22.40	23.00
0.20% C	21.75	22.15	22.25
0.50% C	21.50	21.90	22.00
1.00% C	21.00	21.40	21.50
2.00% C	20.50	20.90	21.00
65-69% Cr, 4-9% C	15.60	16.00	16.15
62-66% Cr. 4-6% C. 6-9% Si.	16.60	17.00	17.15

Briquets — contract price, cents per pound of briquet, f.o.b. shipping point, freight allowed, 60% chromium.

	Eastern	Central	Western
Carload, bulk	9.85	10.10	10.20
Ton lots	10.75	11.65	12.25
Less ton lots	11.15	12.05	12.65

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2¢ per lb to regular low carbon ferrochrome price schedule. Add 2¢ for each additional 0.25% N.

S. M. Ferrochrome

Contract price, cents per pound chrominum contained, lump size, f.o.b. shipping point, freight allowed.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

	Eastern	Central	Western
Carload	16.70	17.10	17.25
Ton lots	17.90	19.20	20.00
Less ton lots	18.60	19.90	20.70

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

	Eastern	Central	Western
Carload	21.00	21.40	21.50
Ton lots	22.35	23.00	24.20
Less ton lots	23.35	24.00	25.20

Chromium Metal

Contract prices, cents per lb, chromium contained, carload, f.o.b. shipping point, freight allowed, 97% min. Cr, 1% max. Fe.

	Eastern	Central	Western
0.20% max. C	83.50	85.00	86.25
0.50% max. C	79.50	81.00	82.25
9.00% min. C	79.50	81.00	82.25

Calcium—Silicon

Contract price per lb of alloy, lump, f.o.b. shipping point, freight allowed.

30-35% Ca, 60-65% Si, 3.00% max. Fe or 28-32% Ca, 60-65% Si, 6.00% max. Fe.

	Eastern	Central	Western
Carloads	14.00	14.50	16.55
Ton lots	16.10	16.85	19.00
Less ton lots	17.10	17.85	20.00

Calcium—Manganese—Silicon

Contract prices, cents per lb of alloy, lump, f.o.b. shipping point, freight allowed.

16-20% Ca, 14-18% Mn, 53-59% Si.

	Eastern	Central	Western
Carloads	15.50	16.00	18.05
Ton lots	17.60	18.45	20.20
Less ton lots	18.60	19.45	21.20

Calcium Metal

Eastern zone contract prices, cents per pound of metal, f.o.b. shipping point, freight allowed. Add 1.5¢ for central zone; 3.5¢ for western zone.

	Cast	Turnings	Distilled
Ton lots	$1.60	$2.35	$2.95
Less ton lots	1.95	2.70	3.75

CMSZ

Contract price, cents per pound of alloy, f.o.b. shipping point, freight allowed.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

Alloy 5: 50-56% Cr, 4-6% Mn, 13.50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

	Eastern	Central	Western
Ton lots	16.00	17.10	19.05
Less ton lots	16.75	17.85	19.80

SMZ

Contract price, cents per pound of alloy, f.o.b. shipping point, freight allowed. 60-65% Si, 5-7% Mn. 5-7% Zr, 20% Fe, ½ in. x 12 mesh.

	Eastern	Central	Western
Ton lots	14.25	15.35	17.30
Less ton lots	15.00	16.10	18.05

Other Ferroalloys

Ferrotungsten, standard, lump or ½x down, packed, f.o.b. plant Niagara Falls, Washington, Pa., York, Pa., per pound contained W, 5 ton lots, freight allowed... $2.25

Ferrovanadium, 35-55%, contract basis, f.o.b. plant, freight allowances, per pound contained V.

Openhearth	$2.70
Crucible	$2.80
High speed steel (Primos)	$2.90

Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, per pound contained V_2O_5 $1.10

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant, freight allowed, per pound contained Cb

Ton lots	$2.50
Les ton lots	$2.55

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo ..... 95¢

Calcium molybdate, 40-45%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo ..... 80¢

Molybdenum oxide briquets, 48-52% Mo, f.o.b. Langeloth, Pa., per pound contained Mo..... 80¢

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per pound contained Mo..... 80¢

Ferrotitanium, 40-45%, 0.10%C max., f.o.b. Niagara Falls, N. Y., ton lots, per pound contained Ti $1.23
Less ton lots $1.25

Ferrotitanium, 20-25%, 0.10%C max., ton lots, per pound contained Ti $1.35
Less ton lots $1.40

High carbon ferrotitanium, 15-20%, 6-8% C, contract basis, f.o.b. Niagara Falls, freight allowed, carloads, per net ton..$142.50

Ferrophosphorus, electrolytic, 23-26%, carlots, f.o.b. (Siglo) Tenn., $3 unitage per gross ton $65.00

Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy.
Carload lots ..... 17.00¢

Zirconium, 12-15%, contract basis, lump, f.o.b. plant, freight allowed, per pound of alloy
Carload, bulk ..... 5.50¢

Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Niagara Falls, carload ..... 6.25¢
Ton lots ..... 6.75¢

Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound
Car lots ..... 9.00¢
Ton lots ..... 9.75¢

Boron Agents

Contract prices per pound of alloy, f.o.b. shipping point, freight allowed.

Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern	Central	Western
Less ton lots	$1.30	$1.3075	$1.329

Manganese—Boron 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max C.

Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

Less ton lots	$2.10	$2.1125	$2.1445

Silcaz, contract basis, f.o.b. plant freight allowed, per pound.
Carload lots ..... 35¢

Grainal, f.o.b. Bridgeville, Pa., freight allowed, 50 lb and over.

No. 1	87.5¢
No. 6	60¢
No. 79	45¢

Bortram, f.o.b. Niagara Falls

Ton lots, per pound	45¢
Less ton lots, per pound	50¢

Carbortam, f.o.b., Suspension Bridge, N.Y., freight allowed, Ti 15—17%, B 0.90—1.15%, Si 2.5—3.0%, Al 1.0—2.0%.
Ton lots, per pound ..... 8.0¢

CED Issues Statement On Program Designed To Aid Small Business

Washington

• • • **A program designed** to strengthen small business in its management, in its finance stage and with respect to taxation, and to improve competitive opportunity is contained in a statement on national policy made public June 11 by the Committee for Economic Development. The statement, which follows 2 years of study by the CED research and policy committee, was made public by Paul G. Hoffman and Raymond Rubicam. Mr. Hoffman is president of the Studebaker Corp. and CED chairman, while Mr. Rubicam is chairman of the research and policy committee.

The statement declares that the number one problem of small business is management, and that more failures are due to lack of skill in running the enterprise than to any other single cause. The committee makes several recommendations to solve this problem.

It proposes that manufacturers, suppliers and trade associations increase their technical aids to small business, that community organizations widen their services and that colleges and universities set up special training courses in this field. Continuing research in the field of small business and expanded service to it by the Dept. of Commerce also are recommended to improve the levels of management.

In the field of financing, the statement points out that the biggest problem of small business is long-term credit and equity capital. It also states that while in times of prosperity most small businessmen receive all the short-term financing they can reasonably use, small business needs assurance that its credit sources will not dry up in emergencies.

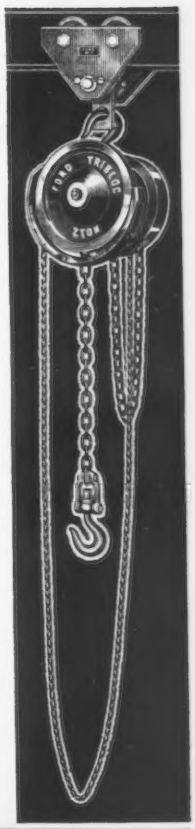
The CED research and policy committee believes the Federal Government should avoid subsidies, direct loans or unrestricted guarantees on commercial loans to business, except in periods of grave emergency. It declares "it is important that our private financial system be enabled to meet the legitimate needs of private

(CONTINUED ON PAGE 128)

do you have a

HANDLING PROBLEM?

...*use* FORD TRIBLOCS



Wherever you make things or repair things, you have to *move* things. That's what we call a "handling problem." And if what you have to move doesn't weigh more than 40 tons, chances are we can help solve your handling problem. FORD Chain Hoists and Trolleys are well-designed—with fewest possible moving parts. And they're ruggedly built—for hard work and lots of it. Capacities from 250 pounds to 40 tons.

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FORD CHAIN BLOCK DIVISION
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TRADE MARK

In Business for Your Safety

MAKE 1947 PRODUCTS ON 1947 PRESSES

Speed, power, streamlining, are the features that distinguish modern automobiles . . . and modern presses.

Put the same efficiency into your production line that is engineered into your products . . . Designed for maximum utility, Danly presses have the mechanical accuracy and rugged construction that make for faster runs, more accurate stampings, longer die life, less downtime, and *greater production.* Enclosed construction saves floor space, lessens safety hazards—especially in rows or batteries.

Bring your production equipment in step with the products you manufacture. *Make 1947 Products on 1947 Presses.*

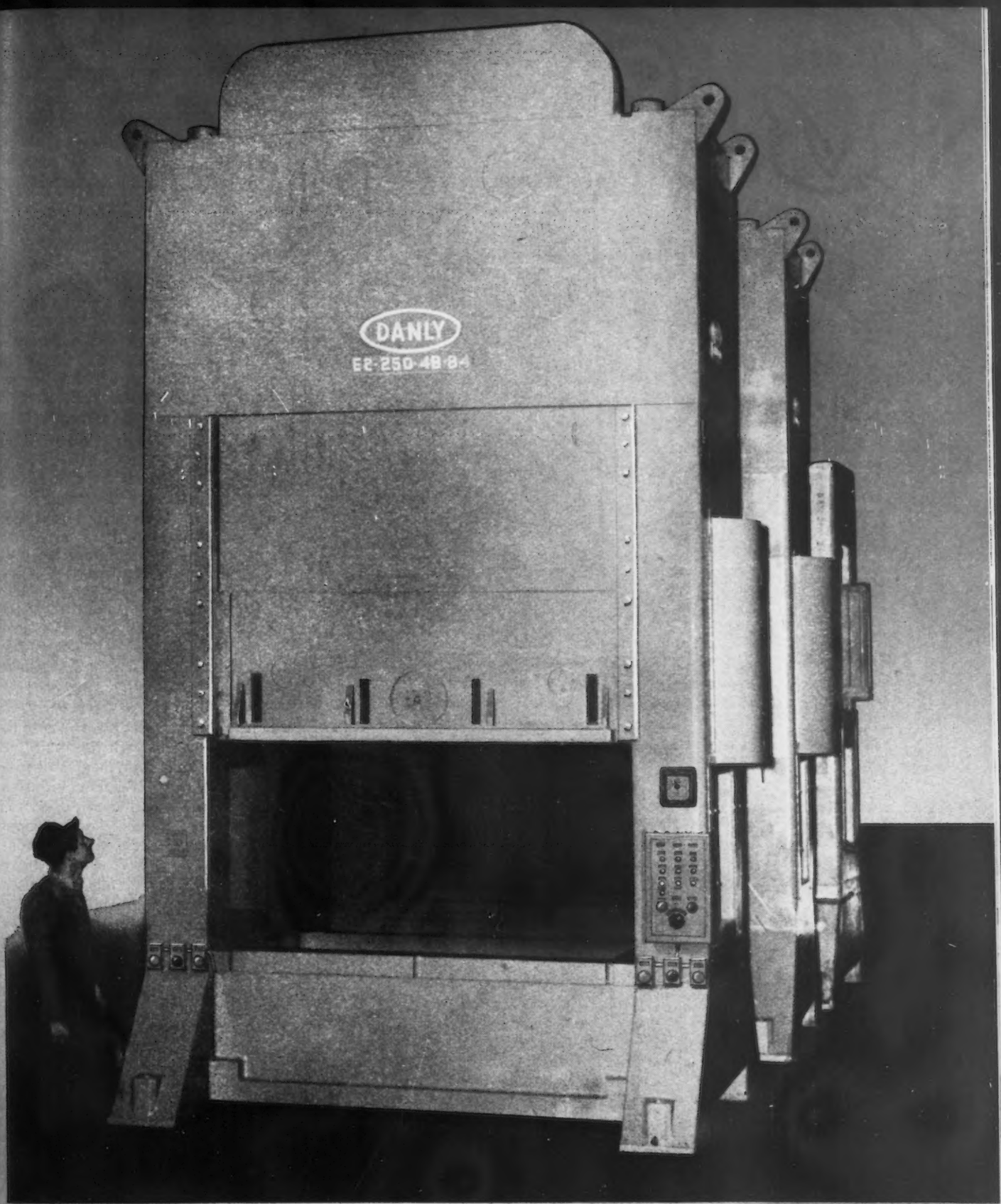
STEEL UNIT FRAMES

Danly Open Back Inclinable and Horning presses have unit frames of rugged one-piece all-steel construction. The frames, massive for presses of this type and size, lend great rigidity and resistance to deflection to these presses. Gears and driving members completely enclosed within the frame run in a spray of filtered oil.

Unusually long gibbing and two slide connections make for even pressure along the full length of the stroke—insure accurate alignment on large or progressive dies—prevent eventual loosening up or slide play due to uneven loads.

Danly O.B.I. and Horning presses range from 50 to 200 tons pressure in both single and two-point models.

DANLY
The Press for Modern Production



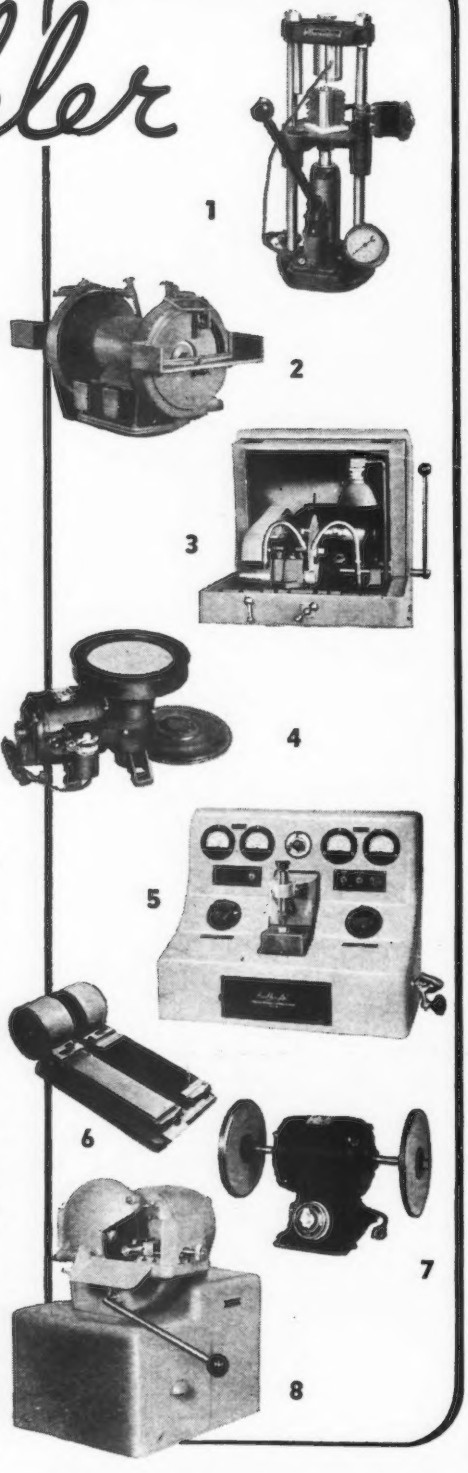
These double geared presses are typical of Danly's complete line of one, two and four point straight-side presses. Pressures range from 100 tons up. Special sizes and types engineered to specifications.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue
Chicago 50, Illinois

Buehler

Offers a Complete Line of Equipment for the . . . METALLURGICAL LABORATORY

Buehler specimen preparation equipment is designed especially for the metallurgist, and is built with a high degree of precision and accuracy for the fast production of the finest quality of metallurgical specimens.



1. No. 1315 Press for the rapid moulding of specimen mounts, either bakelite or transparent plastic. Heating element can be raised and cooling blocks swung into position without releasing pressure on the mold.

2. No. 1210 Wet power grinder with ¾" hp. ball bearing motor totally enclosed. Has two 12" wheels mounted on metal plates for coarse and medium grinding.

3. No. 1000 Cut-off machine is a heavy duty cutter for stock up to 3½". Powered with a 3 hp. totally enclosed motor with cut-off wheel, 12" x 3/32" x 1-1/4".

4. 1505-2AB Low Speed Polisher complete with 8" balanced bronze polishing disc. Mounted to ¼ hp. ball bearing, two speed motor, with right angle gear reduction for 161 and 246 R.P.M. spindle speeds.

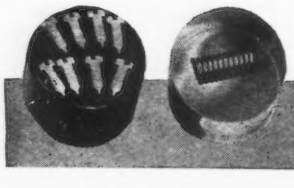
5. No. 1700 New Buehler-Waisman Electro Polisher produces scratch-free specimens in a fraction of the time usually required for polishing. Speed with dependable results is obtained with both ferrous and non-ferrous samples. Simple to operate—does not require an expert technician to produce good specimens.

6. No 1410 Hand Grinder conveniently arranged for two stage grinding with medium and fine emery paper on twin grinding surfaces. A reserve supply of 150 ft. of abrasive paper is contained in rolls and can be quickly drawn into position for use.

7. No. 1400 Emery paper disc grinder. Four grades of abrasive paper are provided for grinding on the four sides of discs, 8" in diameter. Motor 1/3 hp. with two speeds, 575 and 1150 R.P.M.

8. No. 1015 Cut-off machine for table mounting with separate unit recirculating cooling system No. 1016. Motor 1 hp. with capacity for cutting 1" stock.

The Buehler Line of Specimen Preparation Equipment includes . . . Cut-off Machines • Specimen Mount Presses • Power Grinders • Emery Paper Grinders • Hand Grinders • Belt Surfacers • Mechanical and Electro Polishers • Polishing Cloths • Polishing Abrasives.



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(CONTINUED FROM PAGE 125)

business under all ordinary circumstances."

While opposing direct governmental loans the committee favors granting powers to the Federal Reserve System enabling it to guarantee, up to a stipulated percentage, term and capital loans made by commercial banks so that the Federal Reserve System can serve as an agency of stimulation and education in normal times and be in a position to bring its extended powers into full play for use in periods of emergency.

On the subject of taxes the committee favors reforms in those present provisions of the taxing system which are harmful to all business but which, in its opinion, bear on small business with special severity. The committee does not advocate creating tax privileges in favor of small business as a class, but points out that the need of all business is for risk capital and that the soundest sources for such capital are individual savings and the plowing back of earnings into the business.

It is recommended that as rapidly as is consistent with the maintenance of high employment and production without further inflation there should be a general reduction in both business and personal income taxes. Corporate and noncorporate business should have the right to carry forward losses from business operations to apply against subsequent earnings for a period of 6 years, the statement says.

Other recommendations are that taxpayers should be permitted to average their income tax over a period of years to reduce present discrimination against those with irregular incomes, that greater latitude be given for depreciation and that double taxation of corporate income be eliminated.

Finally it offers as one of its major recommendations that the existing federal legislation relating to competition and business practices, such as the Sherman Anti - Trust Act, Miller - Tydings Amendment, Clayton Act, Federal Trade Commission Act, Robinson-Patman Act, etc., be re-examined and recast to clarify objectives and insure consistency in the application of reasonable principles

and methods to further these objectives. Along with the clarification of federal legislation, the committee recommends a reappraisal of current state and local legislation which under the guise of preventing unfair competition may deny competitive freedom and force subterfuges that are especially damaging to small businesses.

An improvement in employee security programs of small business and a general study of management-labor relations with respect to small businesses are recommended.

The statement points out that 98 pct of all business firms in America are small. It notes that of 3,317,000 business units in this country in 1939, when the last U. S. census of business was taken, 1,503,000 had no employees, 1,221,000 had one to three, 305,000 had four to seven, 166,000 had 8 to 19 and 70,000 had 20 to 49. There were but 52,000 firms with 50 or more employees.

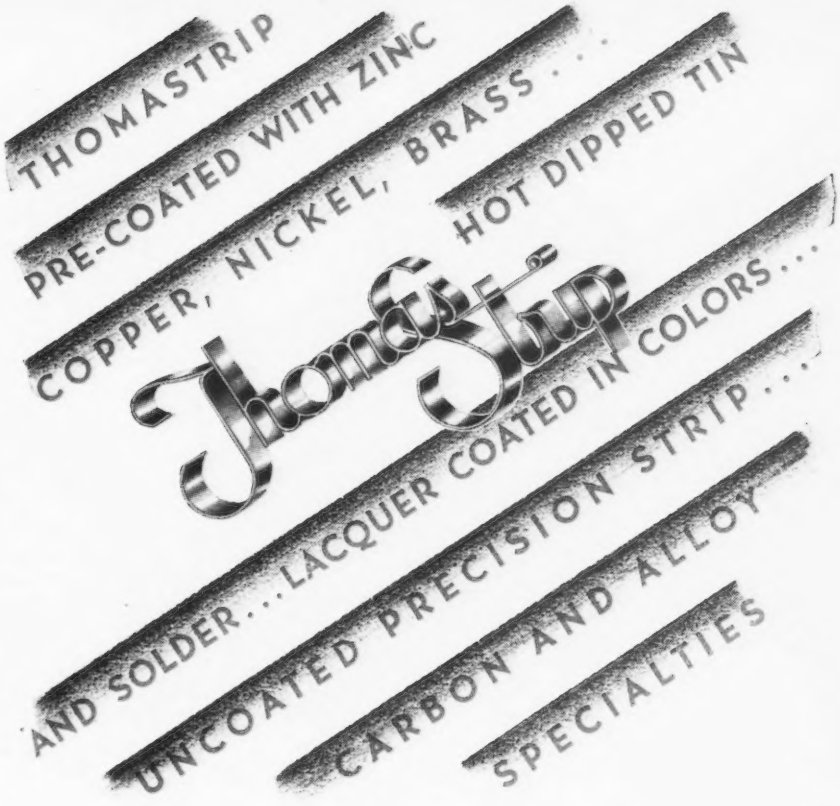
The committee takes the position that small business is more virile and durable than many observers believe. There are today a million more small business firms in the nation than we had in 1900. Small firms provide about 35 pct of the nation's volume of business while affording employment to 45 pct of all those engaged in business, either as employers or workers, the statement declares. In concluding it says:

"Our goal is equality of opportunity for every type and size of business. This is vital in preserving a healthy, growing and productive system of business enterprise, and by the same token, the well being of this country."

To Continue Subsidies

Washington

• • • **Premium payments** on pig iron and cast iron soil pipe for housing requirements will be continued through June 30, at least, Housing Expediter Frank R. Creedon has announced. He also said, in connection with dropping some controls, that the housing program now continues to maintain only two direct allocations—pig iron to producers of cast iron soil pipe and shopgrade lumber to millwork producers.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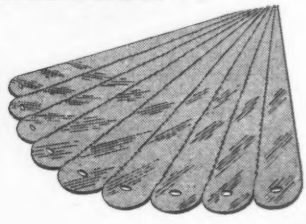

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Army to Begin Program Of Mobilizing Reserves Of Specialized Workers

Washington

• • • **Recruiting** of 2500 special reserve units, consisting of civilian workers, from industries, hospitals and virtually all other segments of the country will be started next month by the Army as part of a broad mobilization plan for application in the event of sudden war such as would come in this atomic age. It is hoped to complete the program within 6 months. To be obtained on a voluntary basis, the workers would operate as skilled forces that already have the basic "know how" to perform their assignments which would call for special Army needs.

This is part of a comprehensive plan of total mobilization and an expansion of the World Wars I and II system that was explained recently to members of Congress and representatives of industry, education and labor by Secretary of War Robert P. Patterson and Gen. Dwight D. Eisenhower, Chief of Staff. The plan was given warm support by those who were present at the conference. Inasmuch as there are no funds available as yet to pay them, it was explained that patriotism was the lone incentive for joining of the units. "Affiliated units" would be a large part of the Organized Reserves.

As pointed out by Lieut. Gen. C. P. Hall, director of organization and training, the plan has the advantage of mobilizing the skilled workers immediately as a unit without being drafted as individuals. Then they would be assigned to particular services which generally would be the same as those performed as civilians. This, it was pointed out, would avoid undue dispersals in general services.

Army technical services would directly contact industries, transportation agencies, hospitals and practically all other of the many institutions of the nation and ask executives to sponsor the reserve units. Representatives of given industries and institutions would be charged with furnishing supplies and services refined to Army needs. Some workers would require special training while others would not.

The affiliation principle was used to a limited extent in World Wars I and II but is new in that it will be the first time that it has been coupled on a major scale with the Organized Reserve Corps. It is proposed to establish 2384 units in different branches of the War Dept. Among the units included would be: Chemical, 96; Engineer, 527; Ordnance, 175; Quartermaster, 603; Signal, 213, and Transportation, 61.

Notes Production Rise In Foundries Despite Raw Material Shortage

New York

• • • **During the first** 3 months of 1947 gray iron foundries in the United States produced 1,043,000 product tons per month, an increase of 15½ pct over the monthly average in 1946, Donald J. Reese declared in an address before the annual meeting of the National Assn. of Purchasing Agents held here recently.

"Inability of the foundry industry to currently produce at capacity is largely the result of a shortage of raw materials, such as pig iron and coke, and labor difficulties," he added. "It appears unlikely that the availability of either gray or malleable iron will improve in the next few months."

"There are about 2800 gray iron and 110 malleable iron foundries in this country," Mr. Reese continued. "With good teamwork between labor and management, an adequate availability of materials and manpower, and enough diversity in industrial needs to keep the various types of foundries busy, these foundries could produce about 1,500,000 product tons of gray iron and 100,000 product tons of malleable iron per month. In 1946 the gray iron foundry industry produced approximately 830,000 product tons per month which was a 2½ pct improvement over 1945.

"Comparable figures on production in the malleable iron industry are 62,650 product tons per month in 1946, which was increased to 75,743 tons per month in the first 3 months of 1947."

In emphasizing the importance of proper scheduling on the part of purchasers in order to encourage maximum production, Mr. Reese said: "Interruption in scheduling

and the practice of scheduling simple parts ahead of complex parts affect overall performance of the industry perhaps to an extent amounting to 5 pct of production. Sufficient patterns should be made available for maximum production. Improvements in design can materially augment production by providing casting patterns easier to make with fewer rejections."

"Prices in the industry," the speaker declared, "are not likely to go down within the next few months and may easily be forced upward. The two most important raw materials to the foundry industry are, first, foundry coke and, second, pig iron. About 3 million tons of coke will be provided to the industry this year, a figure greater than any prior year. Nevertheless the demand is high and the poorer quality means greater losses from wastage and consumption in the melting furnace. The pig iron situation is not likely to be brighter in the next several months although steel scrap may become more available. The quality of scrap is not as good as prior to the war."

Mr. Reese heads the iron and nonferrous casting sections as well as the technical field sections of International Nickel Co.'s Development & Research Div., in New York.

Blast Furnace for Sale

Cleveland

• • • **A $7 million blast** furnace at Monessen, Pa., originally intended for wartime use by the Pittsburgh Steel Co., is being offered for sale or lease to private industry by War Assets Administration.

The furnace, which was nearing completion when the war ended, includes such functional units as engine blower house, cast house, hoist house and numerous other buildings generally constructed of steel framing with corrugated metal siding and brick walls.

The furnace has a daily capacity of 1300 tons of hot metal. Government plans during the war called for utilization of the furnace as a supplier to other Pittsburgh mills at an annual rate of 432,000 tons. When hostilities ceased, however, construction halted abruptly and the plant never has been used.

WAA will accept sealed proposals for the furnace until June 27, when all bids will be opened publicly at regional headquarters here.

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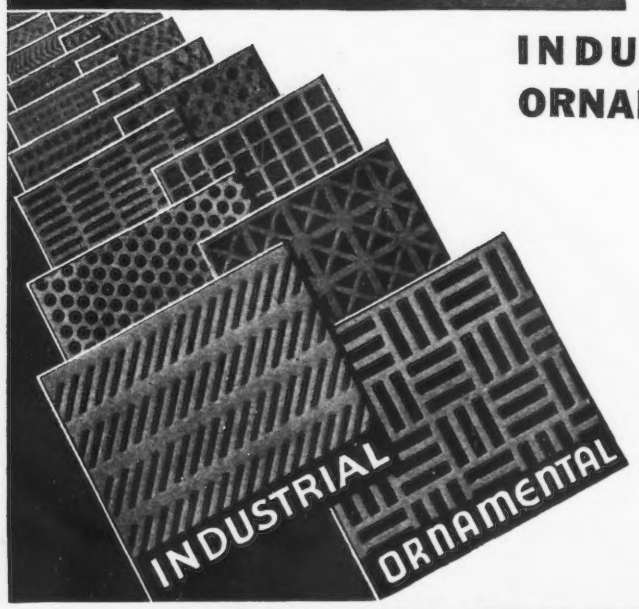

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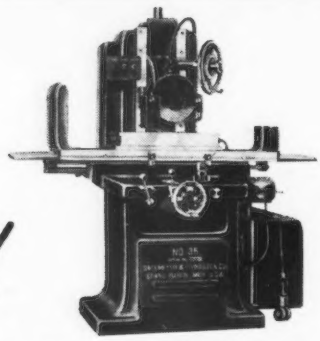

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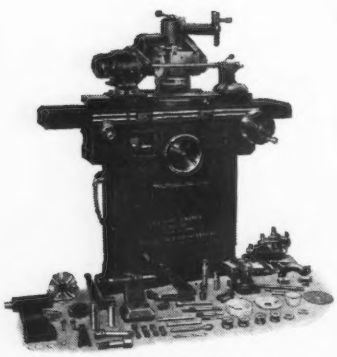

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Grace Recalls Progress Of Bethlehem Steel Co. During Past 20 Years

Bethlehem, Pa.

• • • **Bethlehem Steel Co.** has made notable progress in the past 20 years but the most alert and devoted effort of management and employees is necessary if the corporation is to face the future with confidence, E. G. Grace, chairman of the board, said recently in his 20th annual report to employees.

Mr. Grace's message was included in the May 1947 issue of the Bethlehem Review, which will be distributed to 140,000 employees. The Bethlehem Review, Mr. Grace noted, carried its first official report to employees on earnings in its issue of July 6, 1927.

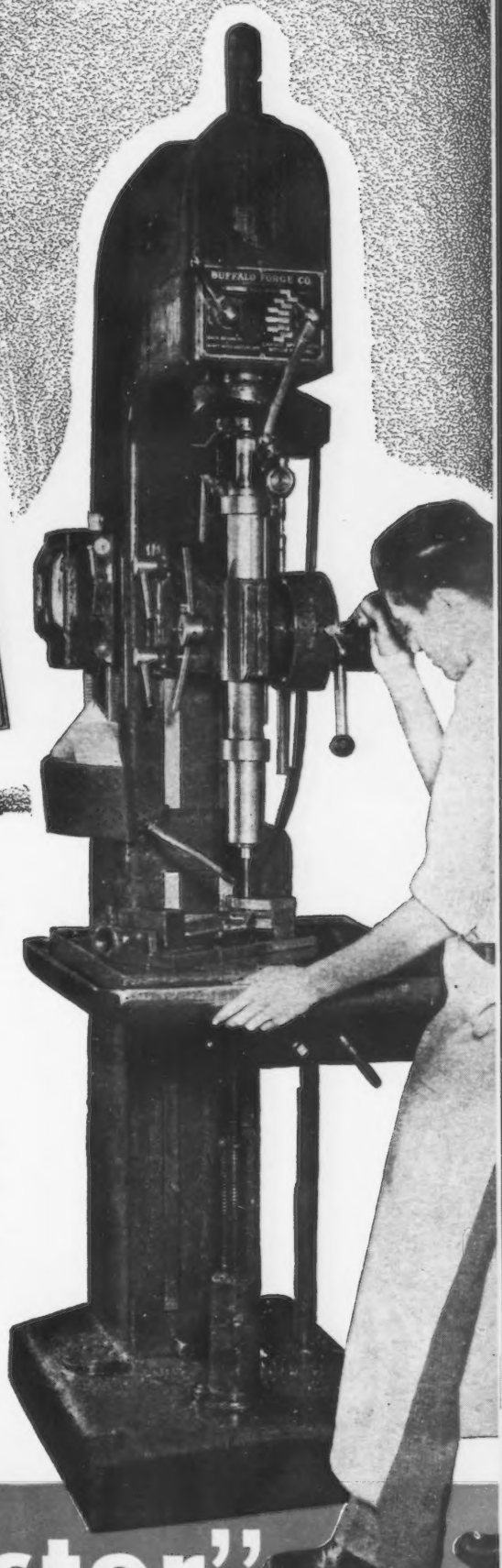
Reporting on the progress of the corporation in the past twenty years, Mr. Grace pointed to the more than doubling of the company's receipts, employment, average hourly earnings and payroll, but emphasized that in contrast the profit margin had contracted.

"The net income in 1926 was 6.7 pct of the money received for goods and services, whereas in 1946 the figure had dropped to 5.3 pct," he said. "There are various reasons for the decline. One, of course, is the great increase in earnings of employees . . . Another is the rise in the costs of all sorts of materials. Further, the war inevitably brought about huge increases in taxes."

Any developments such as improved production processes which can keep steel prices down, he told employees, "will add to our markets, to employment and to the service which we render to the nation."

On safety measures the company reported that the 1946 accident-frequency rate of Bethlehem had reached an all-time low, 64 pct below 1926 and 84 pct under 1916, when an organized safety program was initiated. Both the Johnstown, Pa., plant and the Leetsdale, Pa., works won top national safety honors in their divisions last year.

Another article dealt with welfare in coal mining units and communities. The Review disclosed that the latest mechanical devices



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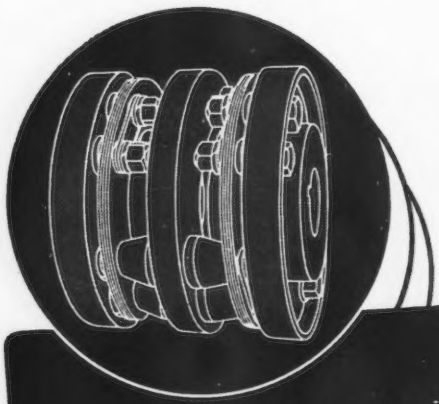

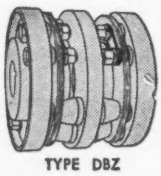

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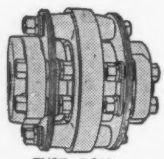

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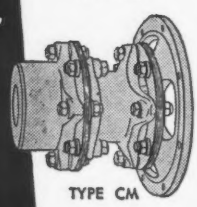

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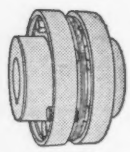

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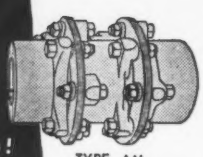

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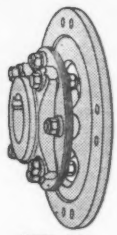

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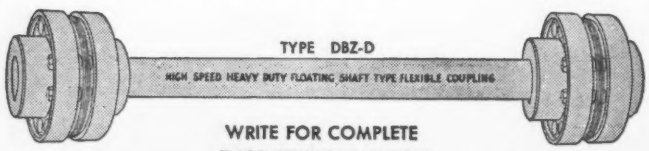

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and procedures are maintained in Bethlehem mines to safeguard employees. "Inspection of the mines is a daily practice, virtually continuous in extent," the Review said. "The accident frequency and severity of Bethlehem coal mines in 1946 were respectively 60 pct and 29 pct better than the averages for the industry for the previous year, as shown by the last published figures."

On the subject of the pension plan, the cost of which is borne entirely by the company, it was reported that disbursements from Jan. 1, 1923, when the plan was inaugurated, to Dec. 31, 1946, aggregated $17,626,560. Average age of the 575 employees added to the pension rolls during 1946 was more than 67 years, and the average period of service was over 39 years. Eighty-one of the employees pensioned in 1946 had service records of more than half a century.

Disbursements under the Relief Plan, which provides at minimum cost sickness, accident and death benefits, totaled $37,156,572 from June 1, 1926, when the program started, to the end of 1946. More than 123,000 Bethlehem employees are now participants in this plan.

Officials in Dept. Of Commerce Appeal For Continuation of OTS

Washington

• • • **Continuation of** the Office of Technical Services, Dept. of Commerce, is being urged by Department officials. They have appealed to a subcommittee of the Senate Committee on Appropriations for $1.7 million for the 1948 fiscal year, contending that captured German technological secrets worth millions being supplied to industry will be lost if OTS is abolished.

The organization recently was knocked out in the House on a point of order that it was being carried in a Department appropriation bill without having been previously approved by Congress. It has been operating under a Presidential order transferring it from WPB to the Commerce Dept.

Under Secretary of Commerce William C. Foster, in urging the appropriation, told the subcommittee that the German technological information is being made

available to the world by OTS and that Great Britain and France are making such information public from their zones. Russia, he said, is "theoretically" cooperating, but actually has refused to reciprocate. Mr. Foster quoted Soviet Foreign Minister Molotov as having said that the German secret technological secrets were "the greatest reparations to come out of the war," valuing the information at $10 billion.

Pending in the Senate is S 493, introduced by Senator Fullbright, D., Ark., for himself, and Senator Aiken, R., Vt., known as the Technical and Information Act. It is designed to continue OTS, though it does not make specific reference to that organization of some 250 in Germany and 600 in Washington, who have been translating and preparing releases. Under the bill the result of technological research and development would be made more readily available to industry and business. It would authorize the Secretary of Commerce to do the work through its Bureau of Standards "or any other facilities which he may have." It would be through "other facilities" that OTS would be continued.

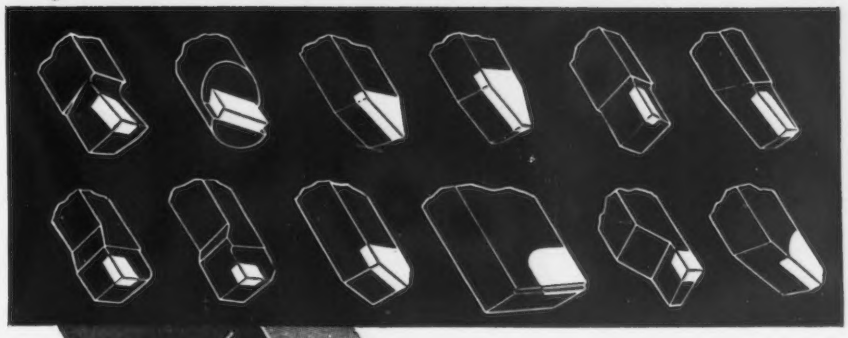
Burt Tells Tool And Die Group of Bright Future in New England

Springfield, Mass.

• • • **At the third** annual New England conference held under the auspices of the National Tool & Die Manufacturers Assn., 350 shop owners and guests heard Clayton R. Burt, board chairman, Niles-Bement-Pond Co., express belief in bright opportunities ahead, despite present narrow profit margins.

Mr. Burt said economy in government expenditures and tax reduction are musts. He said the administration's backing of wage increases has forced costs to unreasonable levels, and profit margins are growing thinner and thinner.

Recalling how ultra-conservatism had lost New England a promising start in the automobile industry, Mr. Burt expressed the belief that now is the time to take some chances and try for the future, dim though the immediate outlook may be. He said that ma-



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chine tools are the backbone of production, but would be useless if there were no tools and dies to go with them.

Dudley Harmon, executive vice-president, New England Council, reported that since 1939 the metalworking industries of New England had doubled their employment, which is now greater than in the better known textile and leather industries.

George S. Eaton, executive secretary, National Tool & Die Manufacturers Assn., told of plans for seeking tax relief for small business and emphasized the importance of an unequivocal free speech provision in the new labor law, so that the small employer will feel free to talk frankly with his employees without fear of reprisal from the National Labor Relations Board.

Arrangements for the conference May 16 were handled by the four New England local tool and die associations, and Frank Mitchell, Mitchell Machine & Tool Co., Springfield, Mass., was chairman of the conference committee.

WAA Offers Surplus War Plants for Sale

Cleveland

• • • **Three northern Ohio** surplus war plants, including the government-owned facility operated during the war by the Ohio Steel Foundry Co. at Lima, Ohio, are being offered for sale by War Assets Administration.

The Lima facility, now idle, has a total floor area of 267,000 sq ft and was constructed on a 26-acre site at a cost of $3,787,000. Sealed proposals for acquisition of this foundry are being accepted by WAA until June 24, when they will be opened publicly at regional headquarters here.

Bids on a magnesium plant at Luckey, Ohio, at present leased by its wartime operator, the Magnesium Reduction Co., are being accepted by WAA until June 26. It consists of 12 major structures, the largest a 177,000 sq ft smelting building. Built on a 200-acre site, its original cost was $2,318,000. Wartime capacity was 10 million lb of magnesium ingots annually.

Sealed proposals will be opened June 25 on a Cleveland plant used during the war and currently leased by the Champion Machine & Forging Co. here.

ONE-COAT Wrinkle Finish FOR...

large furnace* or tiny dispenser

hour saver...dollar maker

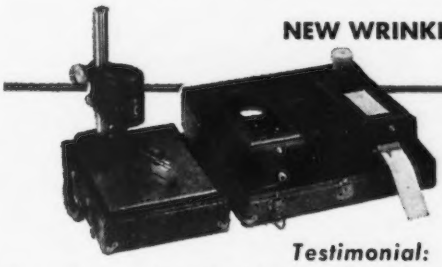
For large areas or small . . . for castings, forgings, stampings or sheets . . . the production economy of one-coat *Wrinkle* finishes is traditional and real.

Wrinkle coatings, in a variety of controlled textures and an unlimited range of colors, covers weldments, scratches, bubbles, tool marks, dents, with a single application by spraying or dipping, without primer coat and with absolute minimum of surface preparation.

And *Wrinkle* is sold by more than 200 manufacturers of industrial finishes. One or more are near you. If you aren't already using *Wrinkle*, try it today.

* Chrysler Airtemp all-year air-conditioning furnace; Specialty Manufacturing Company scotch tape dispenser

NEW WRINKLE, INC. • 137 N. PERRY ST. • DAYTON 2, OHIO



Testimonial:

". . . customer demands *insisted on Wrinkle*. Our experience has proven *Wrinkle* is far more durable . . . diffuses light and prevents glare . . . any and all surface irregularities in castings and sheets completely covered . . ." —Brush Development Company Cleveland, Ohio

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137 N. Perry St. • Dayton 2, Ohio

• Please tell me about the application of Wrinkle coatings on_____

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Company_____

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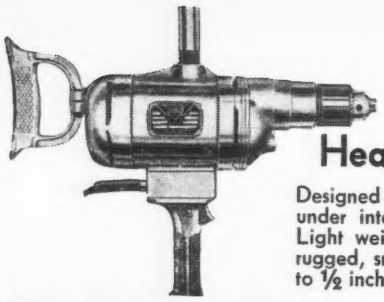


DRILL

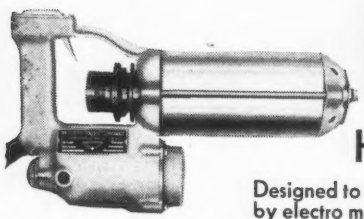
Heavy Duty Electric Drill

Designed to give dependable performance and long life under intermittent or continuous heavy duty operation. Light weight, speedy, and durable it is powered by a rugged, smooth-running Universal motor. Drills holes up to ½ inch in steel.

DRIVE

Screw Driver and Nut Runner

Designed to give extreme flexibility, velvet smoothness and greater load capacity through the new adjustomatic clutch. Driven by powerful, cool-running Universal motor, it drives wood screws up to Number 10, machine screws and bolts up to Number 12.

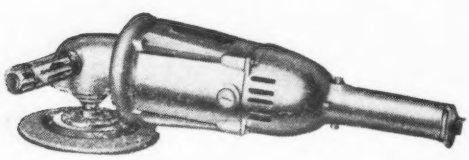


HAMMER

Heavy Duty Electric Hammer

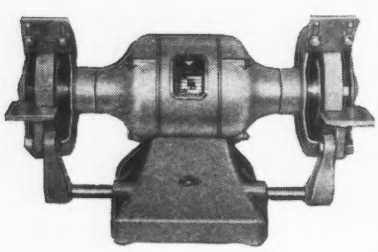
Designed to deliver 3600 powerful blows per minute. Actuated by electro magnets there are no motors, gears, shafts, or bearings to deteriorate under constant vibration. Drills seasoned concrete at rate of 1 inch to 2 inches per minute depending on hardness of material.

SAND



Portable Disc Sander

Designed and powered for sanding, grinding, polishing, wire brushing, stone surfacing and cup grinding on large working areas of wood or metal — wherever large 9 inch disc diameter and high peripheral speed mean economy. All moving parts mounted on grease-sealed ball bearings.



GRIND

Heavy Duty Grinder

Designed to start quickly, operate smoothly under continuous heavy loads. Super-powered, precision-balanced motor and oversize labyrinth-sealed ball bearings mean low cost, steady, heavy duty service. Knee action tool rest for straight or angle grinding.

Better — Faster — at Lower Cost

with these light weight, compact, easy-to-use Millers Falls electric tools. Each has proved its ability to give dependable service and long life on a wide variety of jobs. Write for complete information.

One thing in Common — QUALITY!

MILLERS FALLS COMPANY
Greenfield, Massachusetts

MILLERS FALLS TOOLS
SINCE 1868

Commerce Dept. Says Business Expansion At A Temporary Standstill

Washington

• • • **Business expansion** which has continued for more than a year appears to have come to a temporary halt, it is indicated in the Dept. of Commerce monthly report on business conditions covering the month of April and the 1947 first quarter. This is evidenced largely in the surveys of employment, income levels, manufacturers' shipments, and national production.

Unemployment rose slightly during April but continues in the neighborhood of 2.5 million, the general level since the beginning of 1947; at the same time, the annual income payments (all types) continued at the $177 billion figure of March—an increase of $20 billion or 13 pct above a year ago.

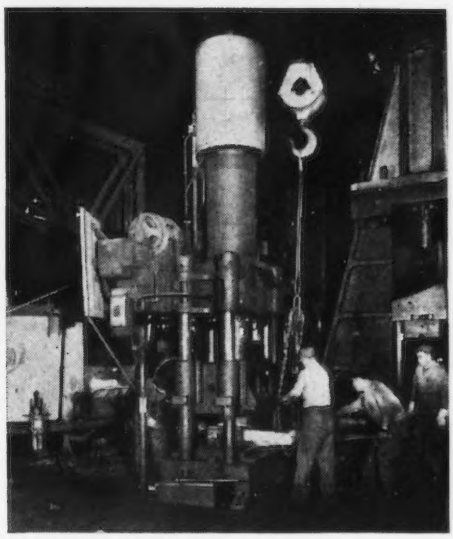
Manufacturers' shipments amounted to $13.9 billion in March; although $1 billion above February, the increase was due entirely to more working days. At the same time, total production of the nation, including the total value of all manufacturers and services, stood at at $209 billion for the first quarter. This represents a gain in dollar volume over the last quarter 1946 but indicates no increase in actual output because of higher prices in 1947.

Retail sales declined somewhat in March for nondurable lines but this was offset by the increase in other type sales as more durables moved into the markets; inventories of business in general continued to build up slowly.

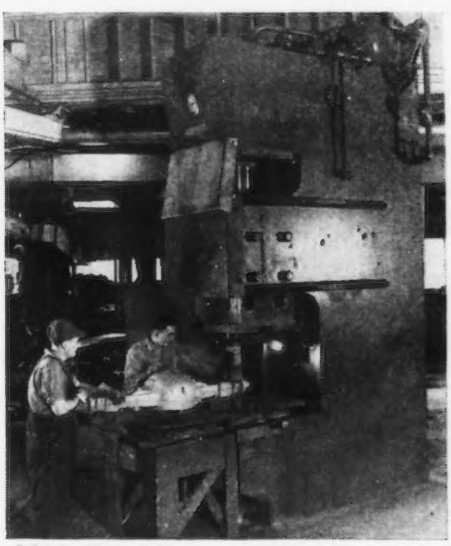
Other economic factors and trends noted in the Commerce first quarter business survey included: An increase in consumer spending, from $121 billion in the first quarter 1946 to $138 billion in 1947, due largely to higher prices; a new high of 80 million passenger tire production, 60 pct above the prewar rate; a monthly average of 273,000 passenger cars as compared with 270,000 for the final quarter 1946; new production levels in washing machines and vacuum cleaners, declines in refrigerators and radios; increased exports of good and services.

Hot or Cold...

IT MAKES NO DIFFERENCE



HOT—This 400 ton, 4 column, self-contained Farquhar Hydraulic Press is used in the shipbuilding industry for trimming and forging hot metal



COLD—This 200 ton self-aligned gap type Farquhar Hydraulic Press is used by the Albion Malleable Iron Co for cold shearing of gates from miscellaneous automotive castings weighing up to 300 lbs.

Farquhar HYDRAULIC PRESSES

SAVE
- TIME
- MONEY
- LABOR

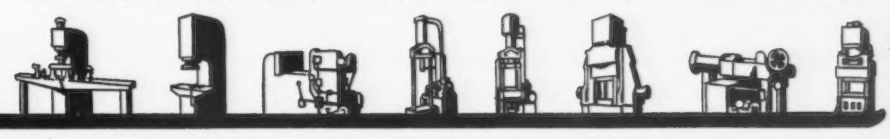
In the metal working field, no matter what the job—hot or cold—there's a Farquhar Hydraulic Press to save time, labor and money.

You save with Farquhar Hydraulic Presses because they are designed to do a job quickly (fast advance and return of ram), accurately (machined for precision work), efficiently (no wasted power).

Consult our experienced Engineers . . . There's a speedy, accurate, efficient Farquhar Hydraulic Press for your exact requirements.

WRITE TODAY . . . ask for a copy of the new 1947 Farquhar Hydraulic Press Catalog.

HYDRAULIC PRODUCTION PRESSES
MATERIAL HANDLING CONVEYORS • SPECIAL MACHINERY



Farquhar
HYDRAULIC PRESS DIVISION

A. B. FARQUHAR COMPANY
1503 N. DUKE ST. YORK, PENNSYLVANIA

"Here is another example of SUPERKOOL superiority for precision grinding"

...excerpts from D. A. Stuart Oil Co. Performance Report on SUPERKOOL 31K

PROBLEM: Precision grinding finish of 4 to 6 micro inches required on compressor valve units, using a 500 grit wheel on Norton Hyprolap machines. Previous mixture of 1 part kerosene and 2 parts red engine oil unsatisfactory.

SOLUTION: Use of a 1 to 1 blend of SUPERKOOL 31K and kerosene.

RESULTS: Operator reported less mist from the machine...Production increased to 200 pieces...Finish improved 2 to 4 micro inches...subsequent tests proved completely satisfactory results by using SUPERKOOL 31K straight on micromatics, and the above dilution on the Hyprolap machines... Foreman and lubrication engineer well pleased...orders for SUPERKOOL 31K to be placed as required.

O. M. Isbom

D. A. Stuart Oil Co., Representative

STUART *service goes with every barrel*

WRITE FOR DETAILS

D. A. Stuart Oil Co. Limited

2737 SOUTH TROY STREET, CHICAGO 23, ILL.

Gallup Poll

(CONTINUED FROM PAGE 107)

similar poll reported in last March. The drop comes after a period when the institute's index of presidential popularity showed a continual rise from the low point of 32 pct just prior to the 1946 congressional elections.

Three items are of special interest in connection with the President's popularity today:

(1) The current figure of 57 pct compares closely with the popularity of Franklin D. Roosevelt in similar institute polls during the years before the war. In the period 1934-39 the proportion of voters saying they were satisfied with the way Mr. Roosevelt was handling his job fluctuated from a low of 50½ pct to a high of 65½. When war came it jumped much higher, but until then it generally averaged around 55-58 pct —or not very different from Mr. Truman's figure.

(2) The halt in the rise of presidential popularity comes at a time when Mr. Truman faces two important political decisions; namely, whether to sign or to veto two major bills sponsored by the Republicans. One is the tax reduction bill; the other is the labor union control bill.

(3) Many Republicans who say they approve at present of the way Mr. Truman is handling his job would not, however, desert their own party to vote for him in 1948. Hence the Truman popularity figure today does not mean that he would poll 57 pct if an election were being held.

Moreell on Navy Board

New York

• • • **The Navy Industrial** Assn. recently announced the election of Admiral Ben Moreell, USN Retired, president and chairman of the board of Jones & Laughlin Steel Corp., as a member of its board of trustees and as second national vice-president of the association.

Admiral Moreell, former Federal Coal Mines Administrator, retired from active duty in the Navy last September. He served during the war as Chief of the Bureau of Yards and Docks and subsequently as Chief of the Materiel Division.

Alloy Steel Service from Seven Warehouses!

A.I.S.I. HY-TEN S.A.E.

ALLOY STEELS

Cutting to length, Heat treating, Forging. Testing, Turning, Special Finishes. Prompt shipment of rounds, squares, flats, hexagons, octagons, and billets.

Technical information and recommendations.

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126 Sidney St. Cambridge 39, Mass.

Cleveland 14, Chicago 23, Hillside, N. J., Detroit 3, Buffalo 10, Cincinnati 32

Westinghouse Sets New Peace Peaks in Output, Workers and Backlog

New York

• • • **Westinghouse Electric Corp.** turned out a new peacetime record of $58,485,244 worth of products during April, Gwilym A. Price, president, has reported. These products ranged from irons and vacuum cleaners to generators and steel mill equipment.

In a report to the company's board of directors, Mr. Price disclosed that this dollar volume of production, as shown by sales billed, was $8 million larger than the previous high peacetime month of March, 1947.

The Westinghouse president pointed out, however, that in the past every inflationary period had been followed by a recession, and that there had been numerous forecasts of such a recession recently. Despite this, he said, the post-war plateau of unusually good business still continues for Westinghouse, and the outlook is that it will continue for some months to come.

Carloadings at the East Pittsburgh works in April increased 38 cars over March and substantial progress was made in supplying electric power generating equipment to utilities. Westinghouse has scheduled for delivery this year almost twice as many kilowatts of turbo-generator capacity as the Company ever turned out before in a single year. Rapid progress is being made in supplying the demand for electrical equipment for new steel mills.

Despite the high rate of production new business booked by Westinghouse in April greatly exceeded production with the result that unfilled orders also hit a new peacetime peak, amounting to $673,381,438 at the end of the month. Long deliveries are still the rule in many heavy apparatus lines and the production of appliances has not by any means caught up with the insistent demand.

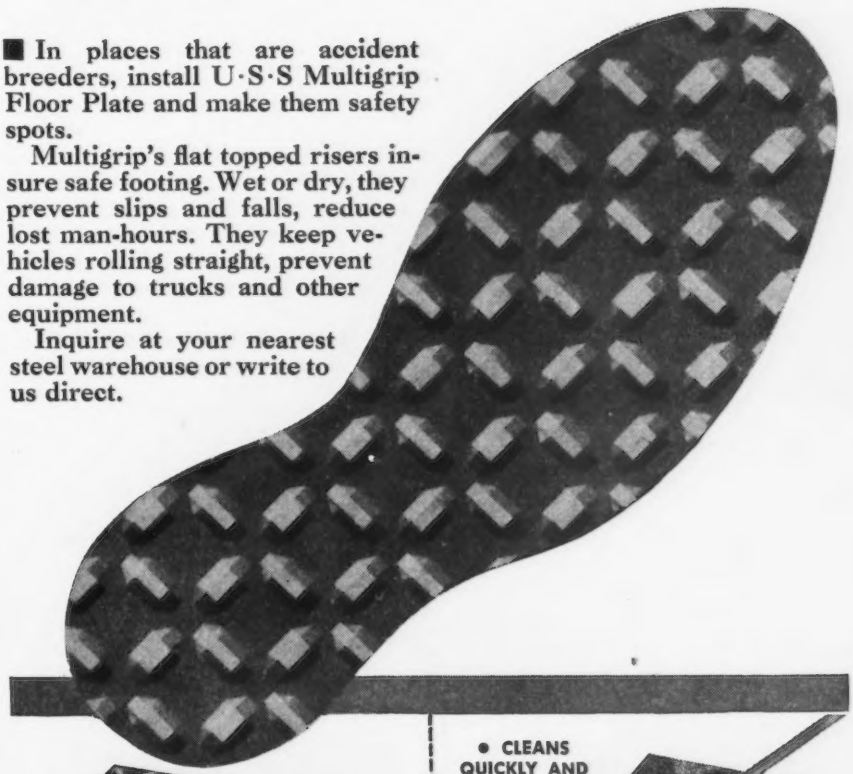
Employment at Westinghouse also reached a new peacetime high in April, with 99,863 men and women on the rolls. This was an increase of 2373 over March employment. At the peak of its wartime effort Westinghouse employed approximately 115,000 persons.

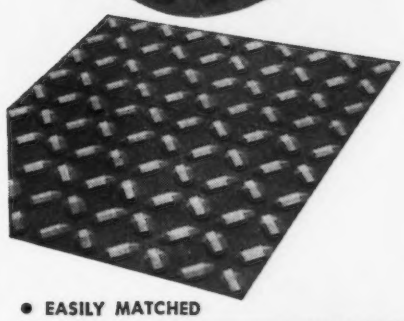
SAFE... STEP BY STEP!

■ In places that are accident breeders, install U·S·S Multigrip Floor Plate and make them safety spots.

Multigrip's flat topped risers insure safe footing. Wet or dry, they prevent slips and falls, reduce lost man-hours. They keep vehicles rolling straight, prevent damage to trucks and other equipment.

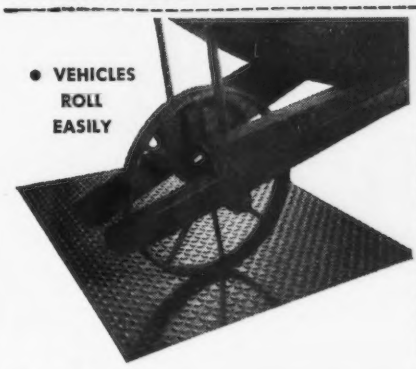
Inquire at your nearest steel warehouse or write to us direct.





• EASILY MATCHED

• CLEANS QUICKLY AND EASILY



• VEHICLES ROLL EASILY

CARNEGIE-ILLINOIS STEEL CORPORATION
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MULTIGRIP FLOOR PLATE
UNITED STATES STEEL

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

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UNITED STATES STEEL

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Fabricators and Erectors of Structural Steel

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STEEL PERMITS STREAMLINING CONSTRUCTION
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DETROIT, MICHIGAN New Center Building
PHILADELPHIA, PA. Commercial Trust Building

Sales Executive Sees Steel Supply-Demand Balance This Year

Chicago

• • • **Speaking before** the Liquefied Petroleum Gas Assn. annual meeting here, Bennett S. Chapple, Jr., assistant vice-president of sales of the U. S. Steel Corp., declared, "Barring unforeseen interruptions, it would appear that certainly by the end of this year, and possibly before, many products will have come into proper balance. When this happens on a large enough scale, American business will once again be operating within the fundamental principles of the law of supply and demand."

Mr. Chapple reviewed the progress made by the steel industry during the war years and explained the many problems confronting the industry today. In concluding, Mr. Chapple stated, "Under normal conditions the steel industry has never failed to keep abreast of normal demand. Steel management has never been faced with more complicated problems than it faces today. On the other hand, the management of the steel industry has never been more adequately equipped to solve these problems. If you compare the demand-supply relationship of 12 months ago with the situation today, I believe you will be heartened, for you will observe that we are making progress."

Auto Equipment Sale

Chicago

• • • **Automotive maintenance** equipment valued at more than a half million dollars was placed on continuous sale at fixed prices recently by the WAA. Included in catalog number CG 13-1062 listing the equipment are lubrication pumps and fittings, fuel transfer pumps, hand oilers and gasoline meters. Part of this equipment is used and part unused.

Surplus used and unused tires, tubes and repair material also was placed on sale at fixed prices. This material is listed in catalog number CG 09-1197.

Both catalogs can be secured from WAA Customer Service Centers located in Chicago and Milwaukee.

Approval of Two New Chapters Granted By Directors of AFA

Chicago

• • • **Two new chapters** of American Foundrymen's Assn., its 37th and 38th, have been approved by directors of the international technical society of the castings industry, according to Chicago headquarters.

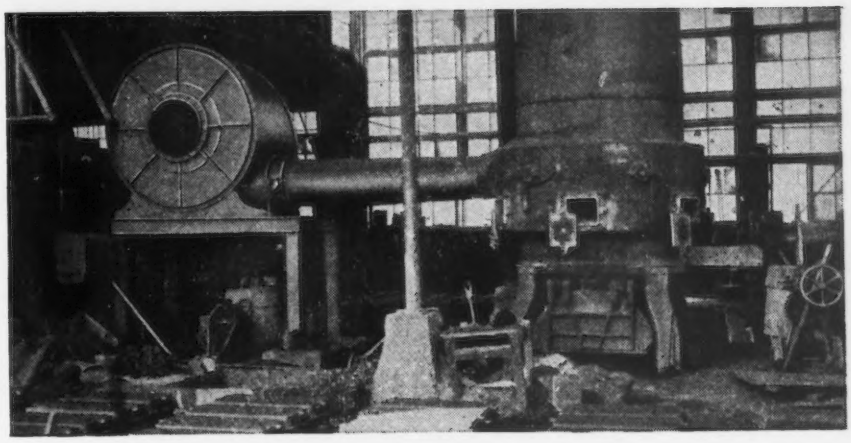
Charters for the British Columbia, number 37, and the central Michigan chapters were granted by unanimous vote of 9400-member associations board upon petition of foundry and allied idustry executives, engineers and technologists of the areas.

Third Canadian chapter of AFA, the British Columbia group will serve the entire province and will have headquarters at Vancouver. The request for its establishment was signed by 80 individuals representing 40 organizations.

Norman Terry, secretary-treasurer of Canadian Sumner Iron Works, Ltd., Vancouver, heads the organizational committee. Vice-chairman and secretary-treasurer, respectively, are Thomas Cowden, manager of Wm. McPhail & Sons (Canada), Ltd., and Lovick P. Young, metallurgist for A-1 Steel & Iron Foundry, Ltd., both of Vancouver.

Included on the committee are William M. Armstrong, assistant professor of mining and metallurgy at the University of British Columbia; Fred Bay, superintendent of Vivian Engine Works, Ltd.; James A. Dickson, owner of Dickson Foundry Co.; Fred E. Done, superintendent for Reliance Foundry Co., Ltd.; James S. Graham, assistant manager of Mainland Foundry, Ltd.; John M. Hughes, metallurgist for Vancouver Engineering Works, Ltd.; Howard A. Sturrock, managing director of Associated Foundry, Ltd., and Harry J. Turney, manager of Westland Iron & Steel Foundries, Ltd., all of Vancouver.

Chapter status for the central Michigan group was requested by 66 individuals representing 24 firms in 12 towns. Centering around Marshall, the chapter will have a territory extending north to Lansing, east to Jackson, west



One thing you can be sure of . . .

THE SPENCER FOUNDRY TURBO

For more than forty years foundrymen everywhere have relied on the performance of the Spencer Turbo Compressor.

The very simplicity of the centrifugal design, with wide clearances, only two bearings, and no special foundations is part of its answer. The Spencer Turbo is inherently ideal for foundries because the volume and weight of air can be controlled by hand or automatically.

Air requirements for foundry cupolas are given in the Spencer Foundry Bulletin No. 112, and complete calculations for all Turbo applications including oil and gas-fired equipment are given in the Spencer Turbo Data Book No. 107.

AND SPENCER VACUUM CLEANING

Overhead dirt and dust are easily removed from pipes, windows, structures and walls with Spencer Portable or Stationary Vacuum Cleaning Systems. Also valuable for reclaiming sand, cleaning molds, patterns and machinery.

ASK FOR THESE SPENCER BULLETINS

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No. 143	Pneumatic Conveying
No. 142	Turbo-Agitation
No. 127	Turbo-Compressors
No. 109	Gas Boosters
No. 112	Foundry Blowers

332-A

SPENCER HARTFORD

THE SPENCER TURBINE CO.
HARTFORD 6, CONN.

For a reliable drive at many angles!

Photo courtesy of Flexsaw Mfg. Co. Port Austin, Michigan

HERE'S an idea worth remembering when you have the problem of driving a machine part which must be adjusted to different operating positions. In the circular saw shown above an S.S.White flexible shaft provides a reliable drive for the saw blade while permitting it to be turned and set at any required angle. S.S.White power drive flexible shafts come in a large selection of sizes, making it possible to use this idea on a wide range of requirements.

WRITE FOR THIS 260-PAGE HANDBOOK

It gives complete facts and technical data about flexible shafts and their application. A copy is yours free if you will request it on your business letterhead and state your position.

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THE S. S. WHITE DENTAL MFG. CO. DEPT. I, 10 EAST 40th ST., NEW YORK 16, N.Y.

FLEXIBLE SHAFTS • FLEXIBLE SHAFT TOOLS • AIRCRAFT ACCESSORIES
SMALL CUTTING AND GRINDING TOOLS • SPECIAL FORMULA RUBBERS
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One of America's AAAA Industrial Enterprises

to Kalamazoo, south to Coldwater, Hillsdale and the state line.

Douglas J. Strong, president of Foundries Materials Co., Coldwater, is organizing committee chairman. John Secor, Hill & Griffith Co. sales representative, Niles, is vice-chairman, and Fitz Coghlin, Jr., metallurgist for Albion Malleable Iron Co., Albion, secretary-treasurer.

Committee members include Kenneth Burlow, foundry superintendent, Marshall Furnace Co., Marshall; Erwin Doerschler, superintendent, U. S. Foundry Corp., Kalamazoo; Oral J. Drunum, foundry manager, Battle Creek Breadwrapping Machine Co., Battle Creek; William E. Fisher, general manager, Reed Foundry & Machine Co., Kalamazoo; John R. Granger, manager, Calhoun Foundry Co., Homer; H. J. McCoy, superintendent, Albion Malleable Iron Co.; Edward H. Schlepp, foundry superintendent, and L. H. Stryker, Riverside Foundry & Galvanizing Co., Kalamazoo.

Lime-Soda Sintering Yields 86 Pct Alumina

Washington

• • • **A high rate** of recovery, from 86 to 89 pct, of alumina from South Carolina kaolin (porcelain clay) has been obtained through utilizing the lime-soda sintering process, according to tests by the Bureau of Mines.

Bureau investigations of high-alumina clay deposits in the state have proved the presence of 10 million tons of kaolin in Aiken county which has an alumina content greater than 33 pct with more than half the total having a content greater than 35 pct. An additional 9 million tons, perhaps many times that tonnage, is indicated in the area, it was said.

Increased demand for aluminum brought on by the war led to the investigation by the bureau in pilot plant and laboratory tests of not only kaolin but siliceous bauxites and other clays.

A plant having a daily capacity of 1000 tons could produce calcined alumina at a cost of $47.96 a ton, using the higher grade ores, the bureau estimates, and at about $50.21 a ton through use of the lower grade. Such a plant would involve a capital investment of $23 million, it is estimated by the bureau.